STRUCTURAL EVALUATION

OF THE

BERKELEY SCHOOLS

FOR THE

BERKELEY UNIFIED SCHOOL DISTRICT

FEBRUARY, 1991

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BUSD STRUCTURAL EVALUATION

INTRODUCTION

ATC-22, A Handbook for Seismic Evaluation of Existing Buildings (preliminary), provides a methodology for evaluating existing buildings to determine potential structural hazards and identify buildings, or building components, that present unacceptable risk to human lives when subjected to strong earthquake shaking. This seismic resistance evaluation and prediction of performance has been accomplished generally in accordance with the provisions of ATC-22 for all Berkeley School District buildings. The design earthquake motions specified as a basis for evaluation in ATC-22 are selected so that there is a low probability of their being exceeded during the normal life expectancy of the buildings.

ATC-22 States: "A building does not meet the life safety objectives of this handbook if, in an earthquake, one or more of the following events occur:

1. The entire building collapses
2. Portions of the building collapse
3. Components of the building will fail and fall
4. Exist and entry routes are blocked preventing evacuation and rescue of the occupants."

Procedures described in the handbook have been used for building evaluations. Calculations have been performed when required to determine whether structures and their components meet standards indicated in the handbook. Prediction of performance is subjective where these standards are not met. Our conclusions are based not only on the strict numerical comparisons prescribed in the standards but, also, on our studies of the performance of similar buildings which have experienced strong earthquake shaking.

On the basis of our subjective predictions a rating for each of the life safety objectives has been listed for each building, or building element, and notations have been made on tables which accompany the discussion for each building.

Ratings in relation to life safety objectives are as follows:

1. Not probable
2. Low probability
3. Moderate probability
4. High probability

EXECUTIVE SUMMARY

Buildings which may sustain major structural damage with a high probability of partial or complete building collapse.

Cragmont	- Classroom Building
	- Multi-use Building

Buildings which may sustain significant structural damage with moderate probability of partial or component collapse.

Whitter	
Berkeley High	- A building (cafeteria)
East Campus	- Walkway Roof Structure
Columbus	- classroom building
Washington	- classroom building
West Campus	- Boys Gym
Berkeley High	- connecting bridges between B & C buildings
Berkeley High	- connecting bridge between C & G
1000 Oaks	- all buildings
West Campus	- Library

Buildings which may sustain moderate structural damage with low probability of element collapse.

M. L. King	- Classroom building
Berkeley High	- G Building - Science/Commerce
	- H Building - Shops
	- E Building - Gym & Swimming Pool
Malcolm X	- Main classroom building
Hillside	- Central Classroom Wing

In the remainder of the buildings, little or no probability of hazardous damage exists. Damage which may occur includes spalling of concrete, falling plaster, glass breakage, and in some cases, minor obstruction to egress.

LeConte
Oxford
Franklin
Berkeley High School
Buildings B, C, D and F

M.L. King Jr. High
Buildings G, MC, SI
Longfellow
East Campus - Buildings (excludes walkway structure)
Hillside - All except central classroom wing
Willard Jr. High
Buildings A, BG, C, CAF, I
Jefferson
West Campus
Building A (administration)
Building B (auditorium & classroom)
Building C (classroom)
Building D (cafeteria)
Building E (industrial arts)
Building G (girls gym)
John Muir
Emerson
Malcolm X Annex

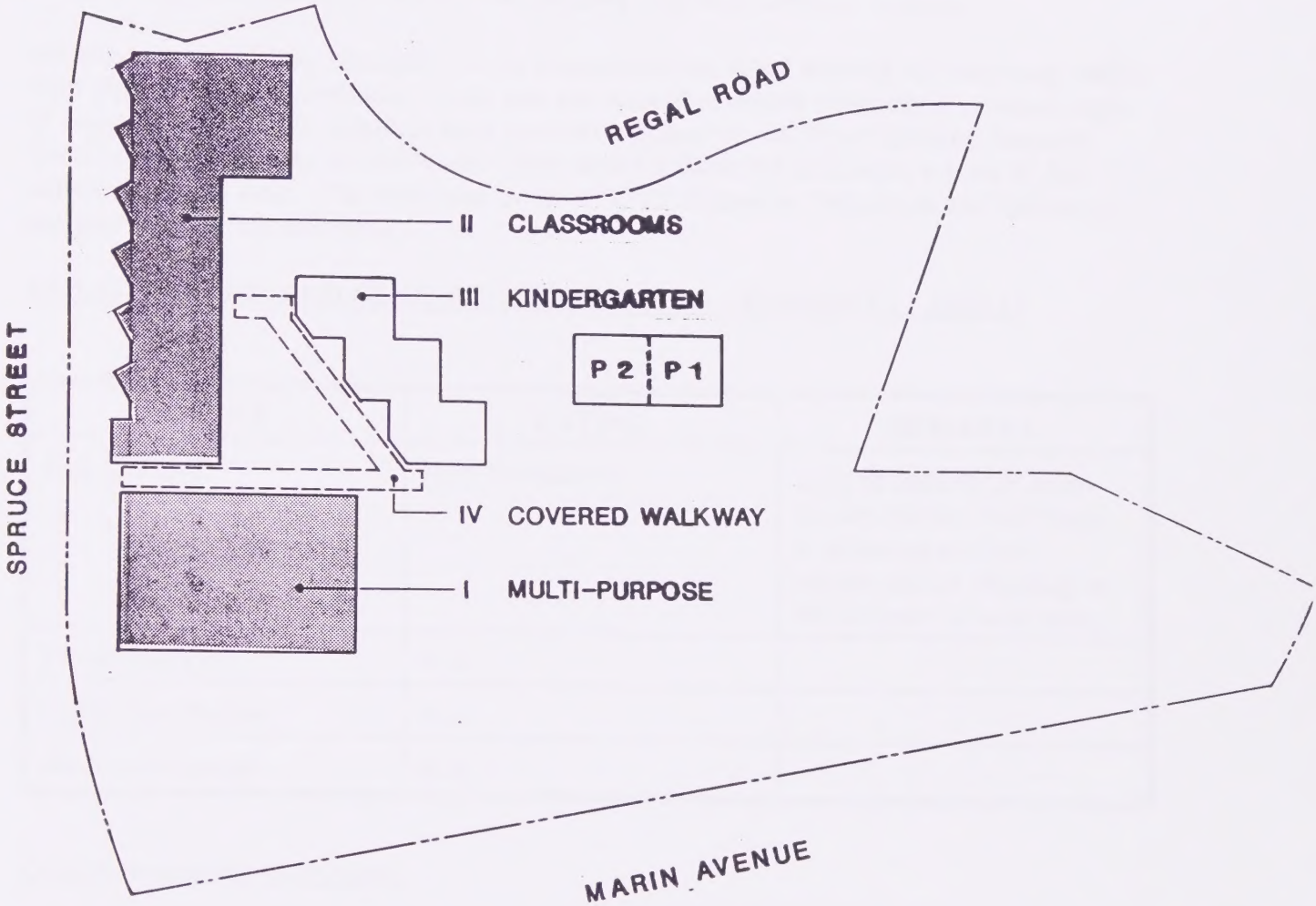
Portable buildings have been evaluated in general terms but have not yet been evaluated for specific school sites and foundation conditions.

Other District - owned facilities that do not house students, such as parent nurseries, voluntary programs, administration, maintenance and transportation buildings and miscellaneous other structures will be evaluated following issuance of this report.

SCHOOL: **CRAGMONT**

LOCATION: Regal Road between Cragmont Avenue and Spruce Street

DATE OF CONSTRUCTION: Classroom building built 1966
Multi-purpose building built 1966
Kindergarten and covered walkway built 1975



INDICATES AREAS WHERE HAZARD POTENTIAL HAS BEEN NOTED

SITE PLAN

40 0 80
20 40

CRAGMONT

For purposes of evaluation the school has been divided into four elements as indicated on the accompanying sketch. The Multi-purpose Building (Element I) and Classrooms (Element II) are two-story reinforced concrete buildings with beam-column moment frames in two directions. The Kindergarten (Element III) is a single-story wood frame building with plywood diaphragms and shear walls. The covered walkway (Element IV) is a wooden walkway roof structure supported by free-standing reinforced concrete columns.

All ratings which follow are based on the assumption that wood framing and sheathing hidden from view is in good condition. Areas that are accessible, and/or areas where outward signs of wood deterioration is manifest, have been investigated by the Wood Building Research Center of the University of California. Their report follows the evaluation reports of the individual school sites. The responses to the ATC-22 Evaluation Statements and follow-up analyses indicate the following:

MULTI-PURPOSE AND CLASSROOM BUILDINGS - ELEMENTS I AND II

EVENT	RATING	REMARKS
Full Collapse	High Probability	Lack of ductility in beam column frames could lead to progressive brittle column failure resulting in full collapse of structures.
Partial Collapse	N.A.	
Component Failure	N.A.	
Blocked Entrance	N.A.	

MULTI-PURPOSE BUILDING

Two story reinforced concrete building with beam-column moment frames in two directions.

Evaluation Statements revealed the following suspected deficiencies:

1) Column shear capacity is deficient;
2) Building drift is excessive;
3) Column shear capacity is not sufficient to develop moment capacity;
4) Column moment capacity is less than beam moment capacity;
5) Column tie spacing is excessive;
6) Stirrups and ties are not anchored properly;

7) Column bars are not lapped and confined properly at splices;
8) Beam reinforcement continuous through the lengths of the members is insufficient;
9) Beam reinforcement is lapped outside the center one-half of the member lengths;
10) Beam stirrups spacing is excessive; and
11) Column steel is not dowelled into foundations.

CLASSROOM BUILDING

Two story reinforced concrete building with beam-column moment frames in two-directions. Building is istuated on a steep hillside; columns below first floor level are exposed and vary in length from zero to 20 feet.

Evaluation Statements revealed the following suspected deficiencies:

1) Structure is subjected to significant torsional forces under earthquake loading;
2) Column shear capacity is deficient;
3) Building drift is excessive;
4) Column shear capacity is not sufficient to develop moment capacity;
5) Column tie spacing is excessive;
6) Stirrups and ties are not anchored properly;
7) Column bars are not lapped and confined properly at splices;
8) Beam reinforcement continuous through the lengths of the members is insufficient;
9) Beam reinforcement is lapped outside the center one-half of themember lengths;
10) Beam stirrups spacing is excessive;
11) Column ties are discontinuous at extrior beam column joints;
12) No special reinforcement is provided at slab re-entrant corners;
13) Column steel is not dowelled into foundations.

Discussion:

Both the multipurpose building and classroom building are of non-ductile concrete frame construction. This type of construction is characterized by sudden brittle catastrophic failure under earthquake loading, and is no longer permitted by Code.

ATC-22 is not a building code but rather outlines a methodology for evaluating existing buildings for life safety hazards. It recognizes that structures, even non-ductile concrete frames, that are unlikely to experience non-elastic excursions during an earthquake do not represent a life-safety hazard. In other words, a non-ductile concrete frame, over-designed as required by ATC-22, could still be considered acceptable. The required overdesign is expressed as an increased lateral load, and the increase is considerable; loadings specified for non-ductile frames are four times those specified for ductile frames.

This concept of acceptance for overdesigned existing non-ductile concrete frames is a recent one, developed during formulation of the ATC-22 methodology.

The Cragmont School buildings obviously were not designed to the non-ductile concrete frame standards required by ATC-22

Lack of ductility in the beam-column moment frames is the overriding concern at both the multipurpose building and classroom building. The high probability of full collapse during a strong earthquake precludes consideration of the other life-threatening events listed in ATC-22 and reduces the event-probability table for Cragmont School to that shown on page 2.

Detailed analysis confirmed the deficiencies indicated by the Evaluation Statement responses.

KINDERGARTEN - ELEMENT III

EVENT	RATING	REMARKS
Full Collapse	Not Probable	
Partial Collapse	Not Probable	
Component Failure	Low Probability	Cracking and distortion of shear walls is possible but no collapse or falling debris is anticipated. Low hazard potential.
Blocked Entrance	Not Probable	

KINDERGARTEN

One-story wood frame bearing wall system with plywood horizontal diaphragms and plywood shear walls.

The evaluation statements were all found to be true.

COVERED WALKWAY - ELEMENT IV

EVENT	RATING	REMARKS
Full collapse	Not probable	
Partial collapse	Not probable	
Component failure	Low probability	Cracking of columns is possible but no collapse or falling debris is anticipated. Low hazard potential.
Blocked entrance	Not probable	

COVERED WALKWAY

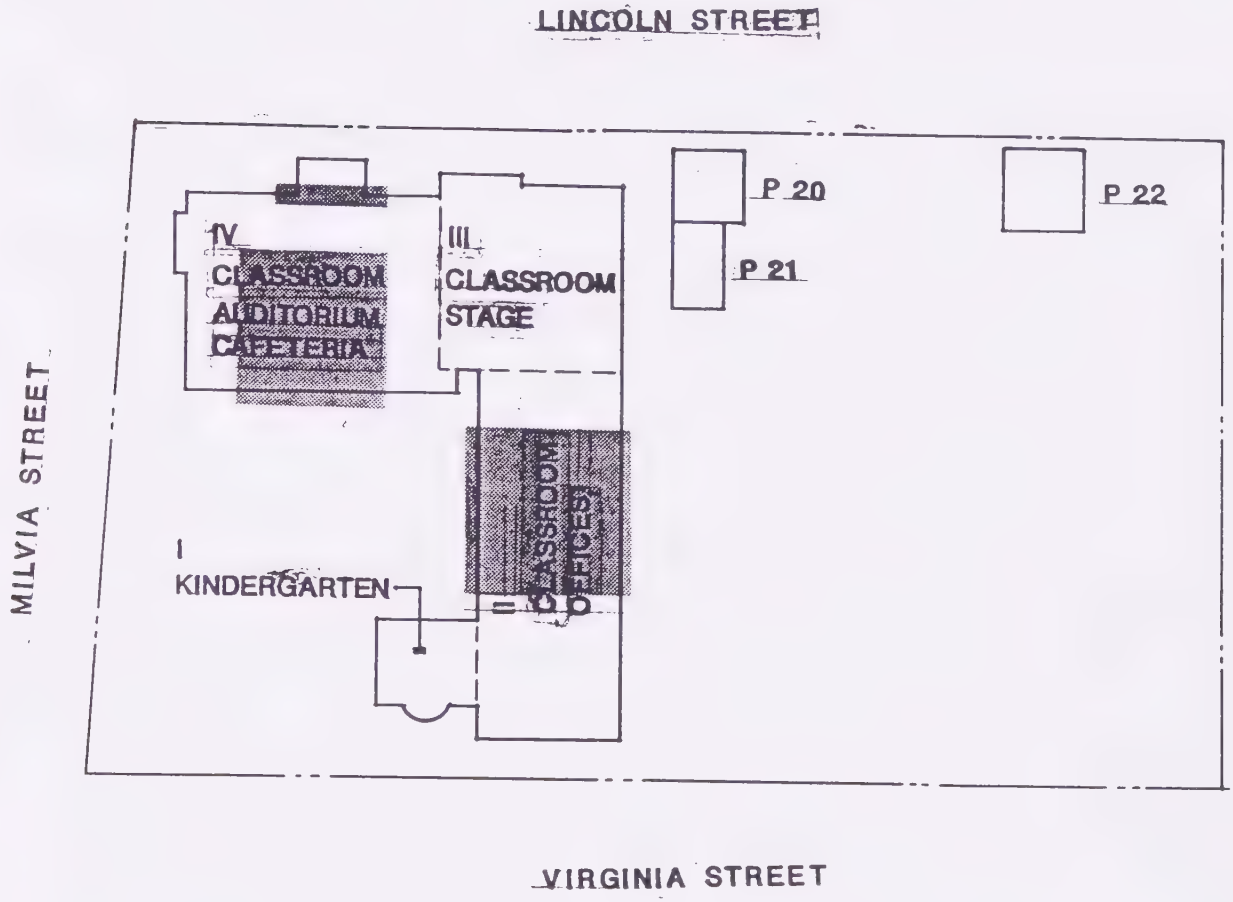
One-story wood structure supported by free standing reinforced concrete columns. The building type is not specifically covered by ATC-22 but conservatively can be classified as a non-ductile concrete moment frame.

Because of the many columns and light loading detailed analysis shows the structure to be satisfactory.

SCHOOL: **WHITTIER**

LOCATION: Milvia Street between Lincoln and Virginia Streets

DATE OF CONSTRUCTION: Original building demolished and replaced with new construction 1939.



SITE PLAN

40 20 0 40 80

INDICATES AREAS WHERE HAZARD POTENTIAL HAS BEEN NOTED

WHITTIER

For purposes of evaluation, the school has been divided into four elements as indicated on the accompanying sketch. The building elements all have concrete walls, columns and floors and wood framed roofs with concrete tie beams at columns lines and diagonal steel braces, except the stage area which has a structural concrete roof slab, and the auditorium roof which has steel beams instead of the concrete tie beams. The classroom portion of elements II and III are two stories high.

All ratings which follow are based on the assumption that wood framing and sheathing hidden from view is in good condition. Areas that are accessible, and/or areas where outward signs of wood deterioration is manifest, have been investigated by the Wood Building Research Center of the University of California. Their report follows the evaluation reports of the individual school sites. The responses to the ATC-22 Evaluation Statements and follow-up analyses indicate the following:

KINDERGARTEN - ELEMENT I

EVENT	RATING	REMARKS
Full collapse	Not probable	
Partial collapse	Not probable	
Component failure	Low probability	Low hazard potential from cracking of coupling beams
Blocked entrance	Not probable	

KINDERGARTEN

One-story concrete and wood frame construction.

Structural concrete first floor slab.

Wood framed roof with concrete tie beams in both directions at column lines, and diagonal steel braces between the interior column line and the building north wall.

Concrete walls and columns.

Evaluation Statements revealed the following deficiencies:

1. Lack of confinement reinforcing in shear wall boundary elements.

2. Lack of shear reinforcing in coupling beams.

Both items were found to be satisfactory by detailed analysis. Coupling beams may experience cracking in the event of a very strong earthquake, but this should not result in significant spalling or falling debris, and does not represent a hazardous condition.

CLASSROOM AND OFFICES - ELEMENTS II

EVENT	RATING	REMARKS
Full collapse	Low Probability	Low hazard potential due to shear wall construction
Partial collapse	Low to Moderate Probability	Moderate hazard potential. Possible loss of support at certain columns.
Component failure	High Probability	High hazard potential. Possible fracturing of concrete at column-beam connections.
Blocked entrance	Low to Moderate Probability	Moderate hazard potential. Falling debris could impair egress.

CLASSROOM AND OFFICES

Two story concrete and wood frame construction.

Structural concrete first and second floor slabs.

Wood framed roof with concrete tie beams in both directions at column lines, and diagonal steel braces between the interior column line and the building east wall.

Concrete walls and columns.

Evaluation Statements revealed the following deficiencies:

1. The existence of a weak story (i.e. in the longitudinal direction there is a strength discontinuity where the lower story is less than 80% of the strength of the upper story).

2. The existence of a soft story (i.e. in the longitudinal direction there is a stiffness discontinuity where the lower story has less than 70% of the stiffness of the story above).

3. Certain shear walls have poor height to length ratios.

4. Confinement reinforcing is deficient in shear wall boundary elements and coupling beams lack shear reinforcement.

5. Reinforced concrete columns and beams to not meet ductile requirements.

All portions of the building were found to be satisfactory by detailed analysis except that reinforced concrete columns and beams do not meet ductile requirements and may be damaged in a strong earthquake.

Discussion:

Shear wall construction reduces the possibility of full collapse, but the flexibility of the horizontal diaphragms may allow large deflections in a strong earthquake. Deflections could result in loss of support and partial collapse at certain column locations. However, it is our opinion that partial collapse is unlikely, as columns at the second floor are lightly loaded. It is more likely that the damage would be limited to fracturing of concrete at the beam-column location, which could result in localized falling hazards (pieces of concrete up to volleyball size).

One concrete beam to shear wall connection which could sustain damage is at a corridor location. Thus there is a moderate probability for component failure, with the possibility of impeded egress.

CLASSROOM AND STAGE - ELEMENT III

EVENT	RATING	REMARKS
Full collapse	Not probable	
Partial collapse	Not probable	
Component failure	Low probability	Low hazard potential from cracking of coupling beams
Blocked entrance	Not probable	

CLASSROOM AND STAGE:

Two story concrete and wood frame construction at classrooms, tall single story construction at the stage.

Structural concrete first and second floor slabs.

Wood framed roof with concrete tie beams in both directions at columns lines, and diagonal steel braces between the interior column line and the building east wall at the classroom portion.

Concrete roof slab at the stage portion.

Concrete walls and columns.

Evaluation Statements revealed the following deficiencies:

1. Lack of confinement reinforcing in shear wall boundary elements.

2. Lack of shear reinforcing in coupling beams.

Both items were found to be satisfactory by detailed analysis. Coupling beams may experience cracking in the event of a very strong earthquake, but this should not result in significant spalling or falling debris, and does not represent a hazardous condition.

CLASSROOM AND AUDITORIUM/CAFETERIA - ELEMENT IV

EVENT	RATING	REMARKS
Full collapse	Low Probability	Low hazard potential due to shear wall construction.
Partial collapse	Low to Moderate Probability	Moderate hazard potential. Possible loss of support at certain columns.
Component failure	High Probability	High hazard potential. Possible fracturing of concrete at column-beam connections
Blocked entrance	Not probable	Vulnerable components are not located at exits.

CLASSROOM AND AUDITORIUM/CAFETERIA

One story concrete and wood frame construction. High roof over auditorium, low roof over cafeteria and classroom areas with lower roof section over corridor between classrooms and auditorium.

Structural concrete floor slab.

Wood joists and steel beams with diagonal steel bracing at auditorium roof.

Wood framed roof with concrete tie beams at column lines at classrooms and cafeteria. Construction similar for lower roof over corridor, but the tie beams occur at a lower level than the tie beams at the classroom roof.

Concrete walls and columns.

Evaluation Statements revealed the following deficiencies:

1. Confinement reinforcement is lacking in shear wall boundary elements and coupling beams.

2. Reinforced columns and beams do not meet ductile requirements in the low roof portion of the building.

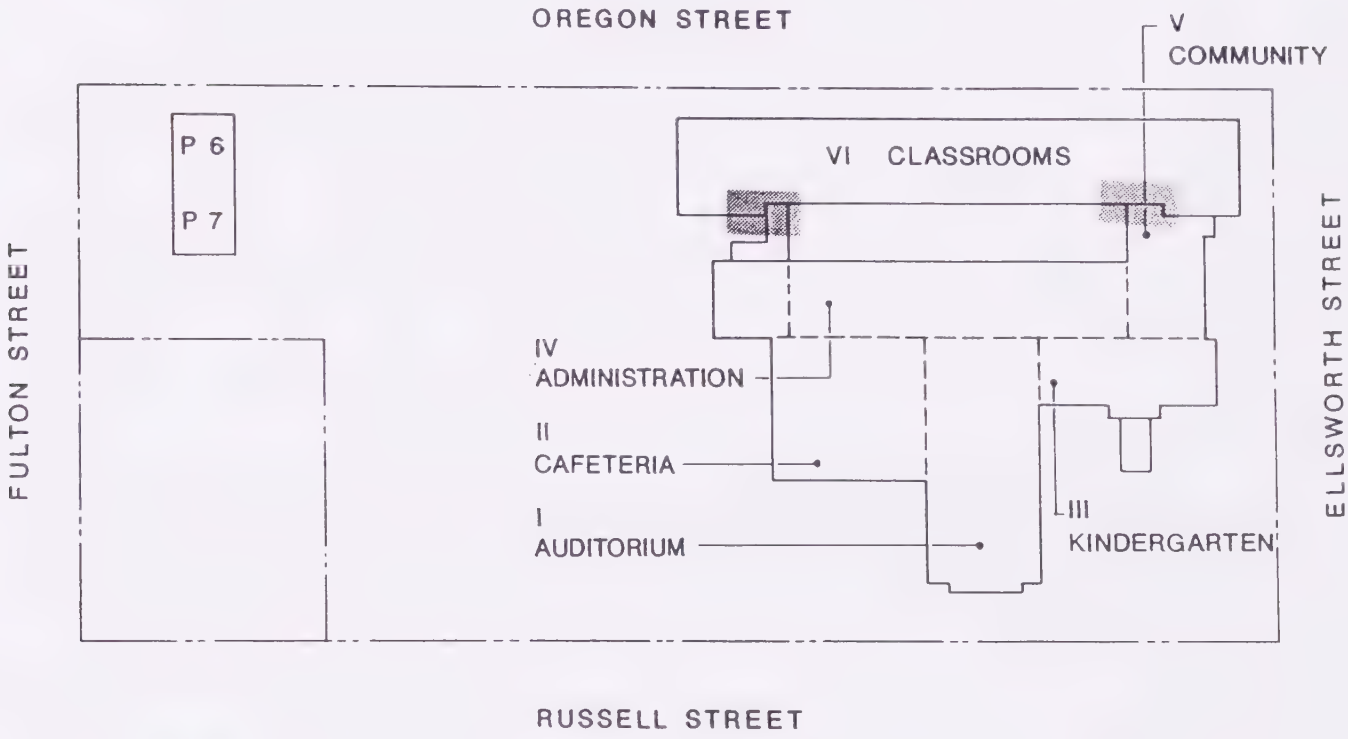
3. Steel beam connection details are weak.

All portions of the building were found to be satisfactory by detailed analysis except that reinforced concrete beams and columns to do meet ductile requirements and may be damaged in a strong earthquake and weak steel beam connections could result in cracking or spalling of concrete, both to a degree which could result in localized falling hazards.

SCHOOL: **LeCONTE SCHOOL**

LOCATION: Ellisworth Street between Oregon and Russell Streets

DATE OF CONSTRUCTION: Original building demolished.
New building constructed 1951.



INDICATES AREAS WHERE HAZARD POTENTIAL HAS BEEN NOTED

SITE PLAN

LeCONTE

For the purpose of this evaluation the school is considered a single building composed of six interconnected elements as described on the accompanying sketch. Elements are of all concrete construction, except the auditorium and the cafeteria/library which have steel trusses and reinforced gypsum for the roof construction. The responses to the ATC-22 Evaluation Statements and follow up analyses indicate the following:

ELEMENTS I THRU V

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Not Probable	---
Component Failure	Not Probable	---
Blocked Entrance	Not Probable	---

ELEMENT I - AUDITORIUM

Tall (27') single story reinforced concrete structure. Concrete slab-on-grade floor and full height reinforced concrete walls on four sides. Steel roof trusses are supported on reinforced concrete pilasters with a 3" thick poured reinforced gypsum roof deck. The lateral force resisting system consists of steel tie rod bracing at the roof level connected to reinforced concrete shear walls.

ELEMENT II - CAFETERIA LIBRARY

Tall (27') single story reinforced concrete structure similar in construction to Element I - Auditorium.

ELEMENT III - KINDERGARTEN

Low (15') single story reinforced concrete structure. Concrete slab-on-grade floor and full height reinforced concrete walls. Reinforced concrete roof slab (joist and beam construction). The lateral force resisting system consists of the reinforced concrete roof slab acting as a diaphragm connected to reinforced concrete shear walls.

ELEMENT IV - ADMINISTRATION WING

Low (14') single story concrete structure. Concrete slab-on-grade floor and full height reinforced concrete perimeter walls and transverse walls in several locations. Reinforced concrete roof slab (joist construction). The lateral force resisting system is similar to Element III - Kindergarten.

ELEMENT V - COMMUNITY ROOM

Low (14') single story reinforced concrete structure. Similar in construction to Element IV, Administration Wing.

The Evaluation Statements were all found to be true for Elements I through V.

ELEMENT VI - CLASSROOM BUILDING

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Not Probable	---
Component Failure	Moderate Probability	Low hazard potential from falling debris.
Blocked Entrance	Not Probable	---

ELEMENT VI - CLASSROOM BUILDING

Two story reinforced concrete structure with story heights of approximately 14'-6". It has a partial basement at the west end. Concrete slab-on-grade floor with full height reinforced concrete walls in the transverse direction and reinforced concrete non-ductile frame construction in the longitudinal direction. The 2nd floor and roof are reinforced concrete beam and one-way slab construction. The lateral force resisting system consists of the roof and floor slabs acting as horizontal diaphragms connecting to transverse reinforced concrete shear walls and longitudinal non-ductile reinforced concrete frames. The frames are stiffened by 12" thick by 19' long reinforced concrete walls at each end of the interior frame line.

The Evaluation Statements were all found to be true except the classroom building has non-ductile reinforced concrete frames in the longitudinal (east-west) direction.

Detailed analysis shows that shear walls at each end of the interior frame line are adequate to limit drift and to resist loads in a strong earthquake. Therefore non-ductile frames are acceptable for vertical load resistance.

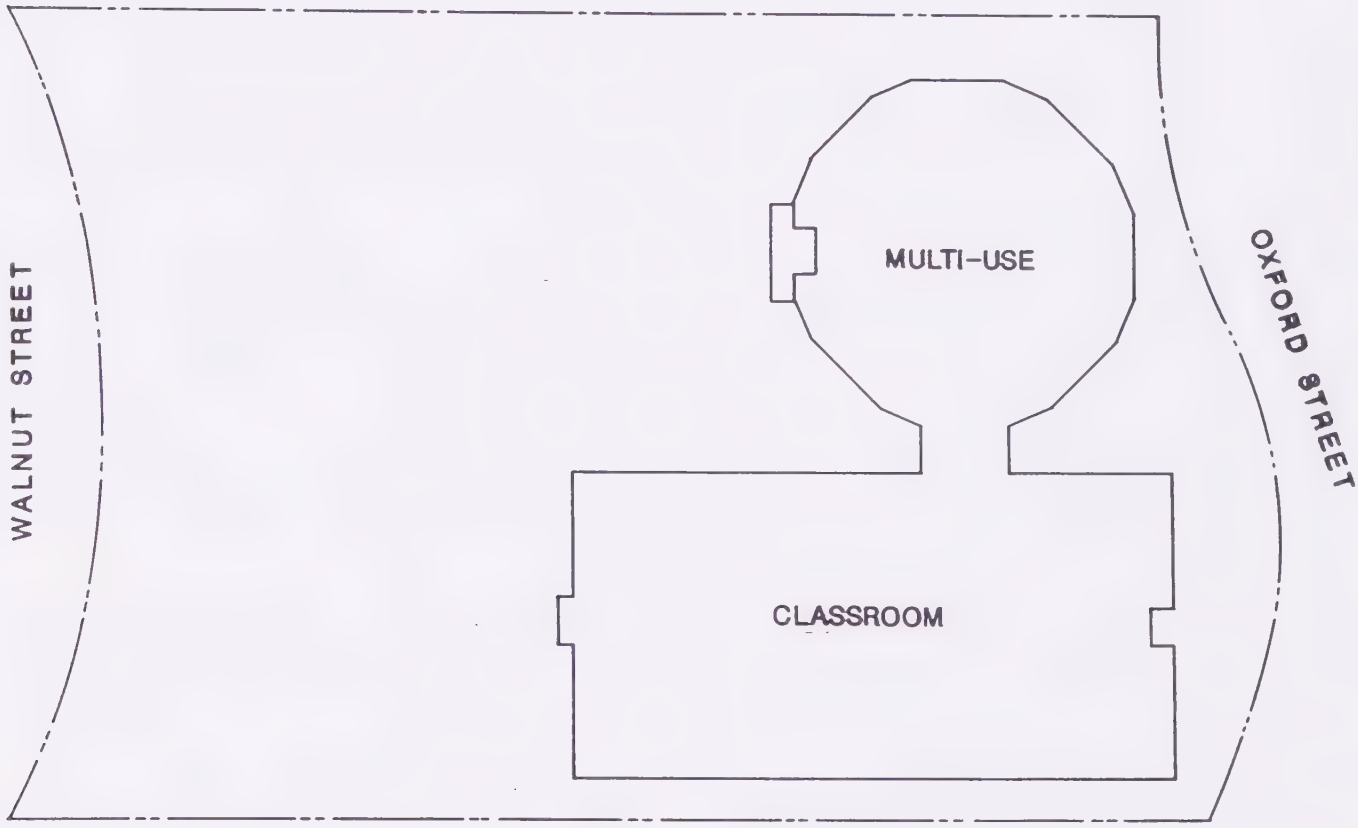
Discussion:

Because the six building elements are tied together an undesirable torsional situation results. This could result in spalling of reinforced concrete members in the East Corridor and Cloister roof structures at their connections to the Element VI, Classroom Building during a strong earthquake. No collapse or partial collapse is anticipated.

SCHOOL: **OXFORD**

LOCATION: Oxford Street between Shattuck and Eunice Streets

DATE OF CONSTRUCTION: Original construction demolished.
Replaced with new construction 1965.



SITE PLAN

5 0 10 20 30 40

OXFORD

The school consists of two structurally isolated elements: a single story wood framed multi-purpose wing and a two story wood framed classroom wing with a partial basement (boiler room) at the west end.

Oxford School is located near the Hayward Fault. Based on available information, the fault appears to be located outside of the site. Many theories as to the exact fault location are available for study. A qualified geologist should review this information.

All ratings which follow are based on the assumption that wood framing and sheathing hidden from view is in good condition. Areas that are accessible, and/or areas where outward signs of wood deterioration is manifest, have been investigated by the Wood Building Research Center of the University of California. Their report follows the evaluation reports of the individual school sites. The responses to the ATC-22 Evaluation Statements and follow-up analyses indicate the following:

MULTI-USE BUILDING

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Not Probable	---
Component Failure	Low Probability	Possible cracking or tearing of wall finishes. Very low hazard potential.
Blocked Entrance	Not Probable	---

MULTI-USE

One-story wood frame bearing wall system with plywood horizontal diaphragms and plywood shear walls.

Evaluation statements all were found to be true expect for the wall requirements. Certain shear walls have poor height-to-length ratios and are not constructed with holdowns.

All items were found to be satisfactory by detailed analysis.

Some shear wall finishes may experience cracking in the event of a very strong earthquake. This should not result in a hazardous condition.

CLASSROOM BUILDING

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Not Probable	---
Component Failure	Low Probability	Possible cracking or tearing of wall finishes. Very low hazard potential.
Blocked Entrance	Not Probable	---

CLASSROOM

Two story wood frame bearing wall structure with partial basement area at west end. Roof and floor diaphragms, as well as shear walls, are sheathed with plywood.

Evaluation statements all were found to be true except that certain shear walls are not constructed with holdowns.

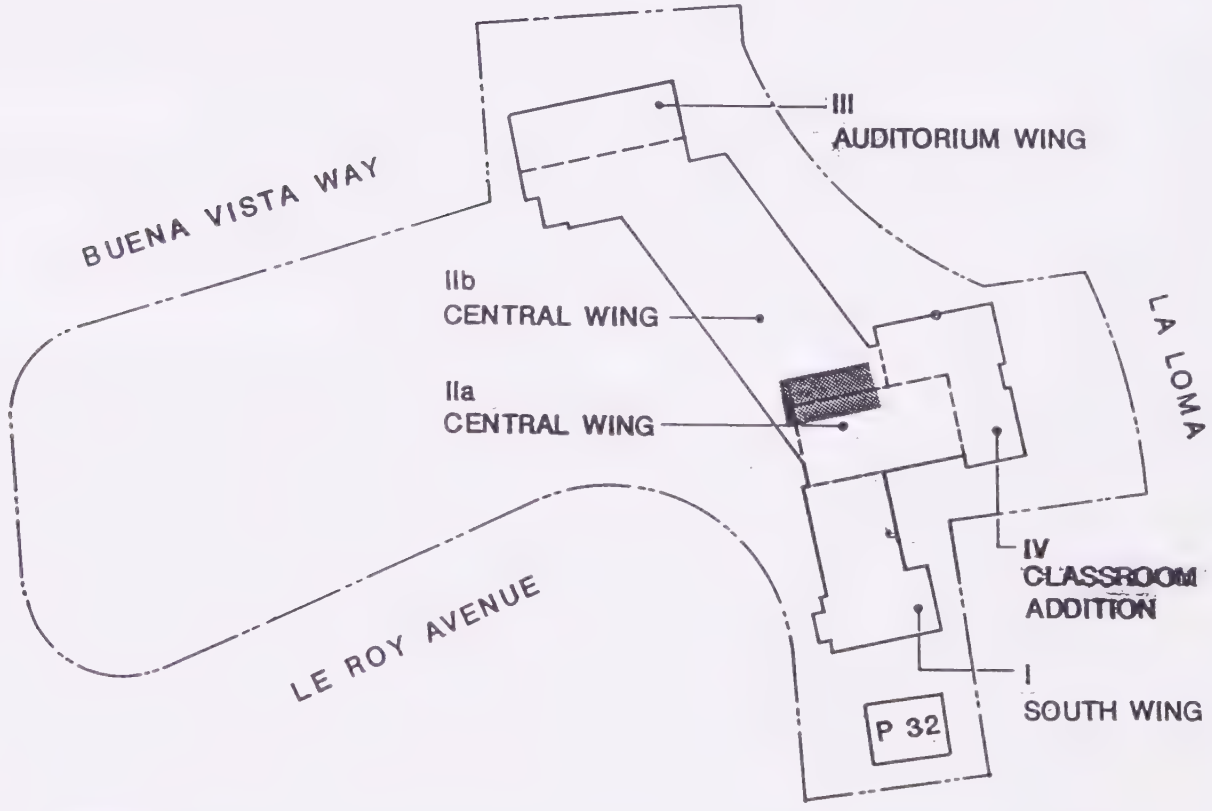
All items were found to be satisfactory by detailed analysis.

Some shear wall finishes may experience cracking in the event of a very strong earthquake. This should not result in a hazardous condition.

SCHOOL: **HILLSIDE**

LOCATION: Buena Vista Way and Le Roy Avenue

DATE OF CONSTRUCTION: Original building constructed 1925.
South wing rehabilitated 1935.
Auditorium wing and central wing rehabilitated 1938.
Classroom addition on west side added in 1965.



SITE PLAN

40 20 0 40 80

HILLSIDE

For the purpose of this evaluation the school has been divided into four elements as indicated on the attached plan. The entire building is of wood frame construction, ranging from one to three stories in height, that varies in elevation to suit the sloping site:

I. 1 story south kindergarten wing
IIa. 2 story central classroom wing
IIb. 3 story central classroom wing
III. tall 1 story auditorium wing
IV. 1 story classroom addition structurally isolated from remainder of construction

Concern has been expressed that the Hayward Fault passes through the Hillside School site. Our best information indicates that the fault actually passes to the west of the site but to our knowledge no investigation of the site has been made to establish the exact location of the fault. An investigation of this subject by a qualified geologist is appropriate.

All ratings which follow are based on the assumption that wood framing and sheathing is in good condition which is still to be confirmed.

The responses to ATC-22 Evaluation Statements and follow-up analyses indicate the following:

SOUTH KINDERGARTEN WING - ELEMENT I

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Not Probable	---
Component Failure	Low Probability	Possible cracking or tearing of wall finishes. Very low hazard potential.
Blocked Entrance	Not Probable	---

KINDERGARTEN WING

Pre-Field Act one story wood frame building strengthened for seismic resistance with additional foundations, diagonally sheathed shear walls, horizontal wood trusses at ceiling level and diagonal wood bracing at roof level.

Evaluation Statements revealed the following deficiencies:

1. Shear walls are not sheathed with plywood and are not constructed with holdowns.

2. Some shear walls have poor height to length ratios.

3. Connection of roof diaphragm to shear walls for lateral load transfer is lacking.

All items were found to be satisfactory by detailed analysis.

Some shear wall finishes may experience cracking in the event of a very strong earthquake. This should not result in a hazardous condition.

CENTRAL CLASSROOM WING - ELEMENT II

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Low Probability	See discussion
Component Failure	Moderate Probability	Possible tearing of second floor diaphragm. Low hazard potential.
Blocked Entrance	Not Probable	---

CLASSROOM WING IIa AND IIb

Pre-Field Act two-story and three-story wood frame building strengthened for seismic resistance with additional foundations, diagonally sheathed shear walls, wood trusses at ceiling level along corridor area for two-story building and along southside for three-story building. Certain horizontal diaphragms have diagonal sheathing re-nailed during retrofit.

Evaluation Statements revealed the following deficiencies:

1. The building fails the sheathing stress quick check.

2. Shear walls are constructed without holdowns except for some interior shears in the crawl space.

3. Some shear walls have poor height to length ratios.

All portions of the building were found to be satisfactory be detailed analysis except for the shearwall between the two and three story segments, which had a demand - capacity ratio, (D/C) of 1.8.

Discussion:

The shear wall lateral load resisting system, coupled with the general construction integrity of the structure, leads us to believe that full or partial collapse is not likely in spite of the high demand-capacity ratio. Tearing and/or minor separation, with attendant distress to finishes, may occur at the second floor level where the two story segment abuts the three story segment. It is our opinion, however, that this would occur only in a very strong seismic event, and represents only a low hazard potential. Further, since most elements vulnerable to distortion are not located at corridors, we would not expect egress to be impeded.

AUDITORIUM WING - ELEMENT III

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Not Probable	---
Component Failure	Low Probability	Some minor components may tear or fracture. Low hazard potential.
Blocked Entrance	Not Probable	---

AUDITORIUM WING

Pre-Field Act one-story wood frame structure with wood rafters and joists, strengthened for seismic resistance with new foundations, transverse steel moment resisting frames, horizontal steel and wood bracing trusses at floor and ceiling levels, diagonally sheathed shear walls and vertical steel truss bracing below first floor and above ceiling ridge. All exterior walls have 2 layers of diagonal sheathing.

Evaluation Statements revealed the following deficiencies:

1. The steel structure does not meet compact member requirements or moment connection and joint webs requirements for qualification as a special moment frame.

2. The steel columns are not well anchored.

3. Steel bracing connections do not develop the yield capacity of the members.

All items were found to be satisfactory by detailed analysis.

CLASSROOM ADDITION - ELEMENT IV

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Not Probable	---
Component Failure	Not Probable	---
Blocked Entrance	Not Probable	---

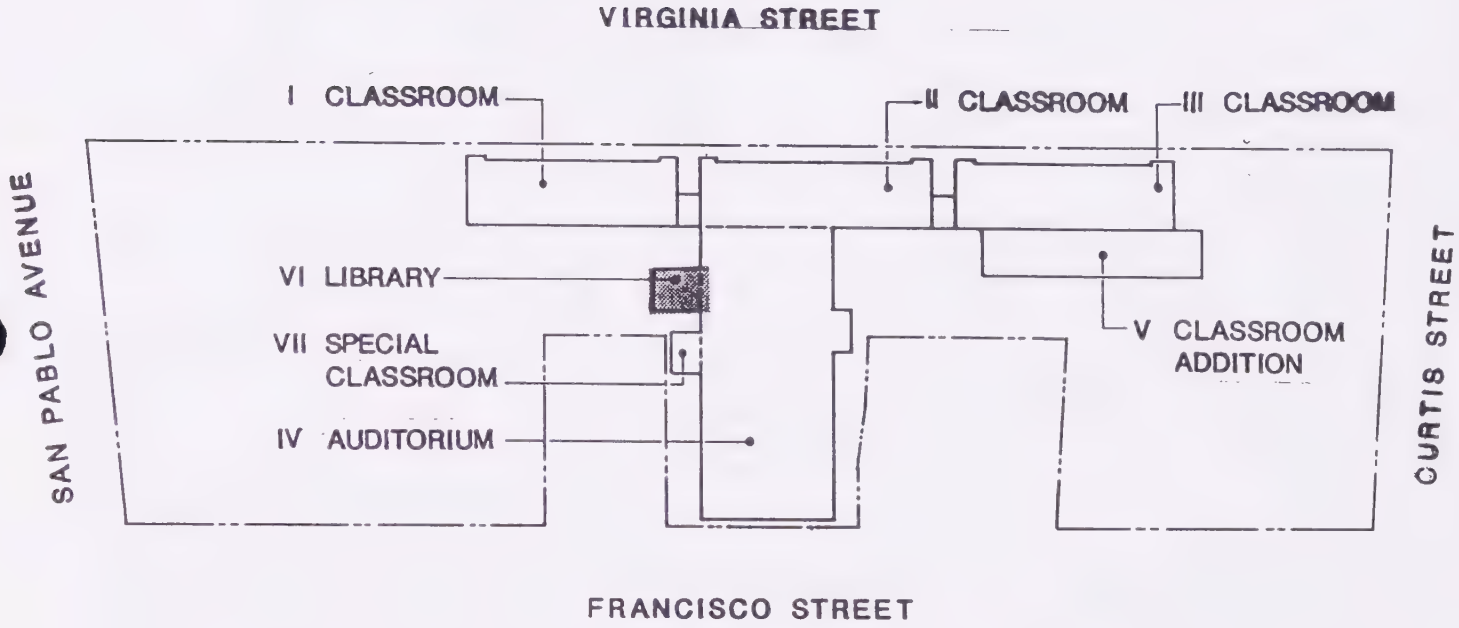
CLASSROOM ADDITION

One-story wood framed shear wall building. All diaphragms, horizontal and vertical, are sheathed with plywood. All evaluation statements were satisfactory for this building and detailed analysis was not deemed necessary.

SCHOOL: **FRANKLIN**

LOCATION: Virginia Street between San Pablo Avenue and Curtis Street

DATE OF CONSTRUCTION: Original building demolished and replaced with new construction 1952.
Toilet building addition 1958.
Classroom and library addition 1964.



INDICATES AREAS WHERE HAZARD POTENTIAL HAS BEEN NOTED

SITE PLAN

5 10 30
0 20 40

FRANKLIN

The school is comprised of seven all reinforced concrete elements as shown on the accompanying sketch. Elements I, II and III are similar two story buildings connected by reinforced concrete stair structures. Element IV is a tall single story auditorium building with a one-story kitchen and special classroom (VII) sections on the south and west sides respectively, and a two-story reinforced concrete library addition (VI) also on the west side. The auditorium portion has a steel framed roof. Element V is a two-story reinforced concrete addition to Element III. The responses to the ATC-22 Evaluation Statements and follow-up analyses indicate the following:

CLASSROOM WING

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Low Probability	Loss of column support is not expected. Low hazard potential.
Component Failure	Low Probability	Low hazard potential from spalling concrete.
Blocked Entrance	Low Probability	Vulnerable components not located at exits.

CLASSROOM BUILDINGS I, II & III

The group is comprised of three two-story reinforced concrete structures connected by reinforced concrete stair elements. Element II, otherwise typical of the other two elements, has a partial basement. The lateral load resisting system consists of reinforced concrete roof and floor diaphragms (concrete joist construction) with reinforced concrete shear walls. Non-ductile reinforced concrete beams and columns support vertical loads between concrete walls at each end of each building. Extensive architectural windowall construction is used. Foundations are a drilled reinforced concrete pile and grade beam system.

Evaluation statements revealed the following deficiencies:

1) Weak story at first level (wing II only).
2) Soft story at first level (wing II only).
3) Torsional problems may exist resulting from a non-uniform distribution of shear wall stiffness at the first level (wing II only). A "missing" shear wall at the southwest corner of wing II, omitted as a result of a conflict with a corridor to wing IV, resulted in suspected weak story, soft story, and torsional deficiencies.
4) Vertical irregularities exist in that shear walls are not continuous to the foundation along the north side.
5) Confinement reinforcing is lacking in boundary elements of shear walls.
6) There is a deficient amount and type of shear reinforcing at coupling beams.

All of the above suspected deficiencies were found to be satisfactory by a more detailed analysis, with the exception that reinforced concrete columns and beams do not meet ductility requirements. It is not expected, however, that the deformations to which these columns will be subjected will cause them to fail.

AUDITORIUM - ELEMENT IV

EVENT	PROBABILITY	REMARKS
Full collapse	Not Probable	---
Partial collapse	Low probability	Loss of column support is not expected. Low hazard potential.
Component failure	Low probability	Low hazard potential from spalling concrete.
Blocked entrance	Low probability	Vulnerable components not located at exits.

AUDITORIUM

The auditorium wing includes a tall, single story main structure with reinforced concrete walls and a steel joist and truss roof system with metal deck (no concrete fill) and built-up roofing. Steel columns embedded in the reinforced concrete walls provide vertical support for the roof trusses. The reinforced concrete walls also serve as vertical elements of the lateral load resisting system for a shorter kitchen and corridor structure around the perimeter of the main structure. This perimeter structure is comprised of a reinforced concrete flat slab roof system with vertical load carrying reinforced concrete columns at the perimeter. Foundations are a drilled reinforced concrete pile and grade beam system.

Evaluation statements revealed the following suspected deficiencies:

1) Multiple openings in the south auditorium wall indicated possible deficiencies associated with torsion.
2) Quick shear wall stress check indicated possible overstress in concrete walls.
3) Suspected lack of strength in untopped metal roof diaphragm.
4) Suspected lack of reinforcing at boundary elements of long, narrow low roof diaphragm elements and;
5) Lack of ductility in columns supporting low roof.

A more detailed analysis showed these suspected deficiencies to be satisfactory with the following exceptions: There is a lack of chord reinforcing in the low roof diaphragm. However, as the main roof reinforcing runs parallel to the chord reinforcing, it can be expected to make up for this deficiency. Also, reinforced concrete columns supporting the low roof do not meet ductility requirements and could be damaged in a strong earthquake.

Discussion:

Shear wall construction virtually eliminates the possibility of full or partial collapse, and reduces the effect of torsion so that loss of vertical support is not expected. Some concrete cracking may occur at certain low roof column connections, and at longitudinal ties at the edges of the low roof diaphragm. This possible damage is not expected to create a falling hazard.

CLASSROOM ADDITION - ELEMENT V

EVENT	PROBABILITY	REMARKS
Full collapse	Not probable	---
Partial collapse	Not probable	---
Component failure	Low probability	Low hazard potential from spalling concrete.
Blocked entrance	Not probable	---

CLASSROOM ADDITION

The classroom addition is a two story reinforced concrete structure which was added adjacent to Building III in 1964. Roof and floor diaphragms are a reinforced concrete slab and joist system, supported laterally by reinforced concrete shear walls. Reinforced concrete beam and column construction makes up most of the north wall framing. Foundations are a drilled pier and grade beam system.

Evaluation statements revealed the following suspected deficiencies:

1) Uneven distribution of shear walls indicate possible problems associated with torsion for east/west loading;
2) Reinforced concrete beams and columns on the north wall lack ductility:

A more detailed analysis showed the above suspected deficiencies to be adequate.

LIBRARY AND SPECIAL CLASSROOM - ELEMENTS VI AND VII

EVENT	PROBABILITY	REMARKS
Full collapse	Not probable	---
Partial collapse	Not probable	---
Component failure	Low probability	Low hazard potential from spalling concrete.
Blocked Entrance	Not probable	---

LIBRARY AND SPECIAL CLASSROOM

These reinforced concrete structures, built with the classroom addition in 1964, share similar characteristics. They consist of reinforced concrete flat slab and beam roof, and reinforced concrete walls. Foundations consist of a drilled pier and grade beam system.

The library structure is two stories in height, the upper story being a 32'x48' "box" supported at the east end by the first story, a 32'x16' "box". Therefore, lower story shear walls are all concentrated at the building's east end. The west end of the upper level is supported on five reinforced concrete columns. The special classroom is a single-story structure with reinforced concrete walls and roof slab, and a slab-on-grade floor.

Evaluation statements revealed the following suspected deficiencies in the library only:

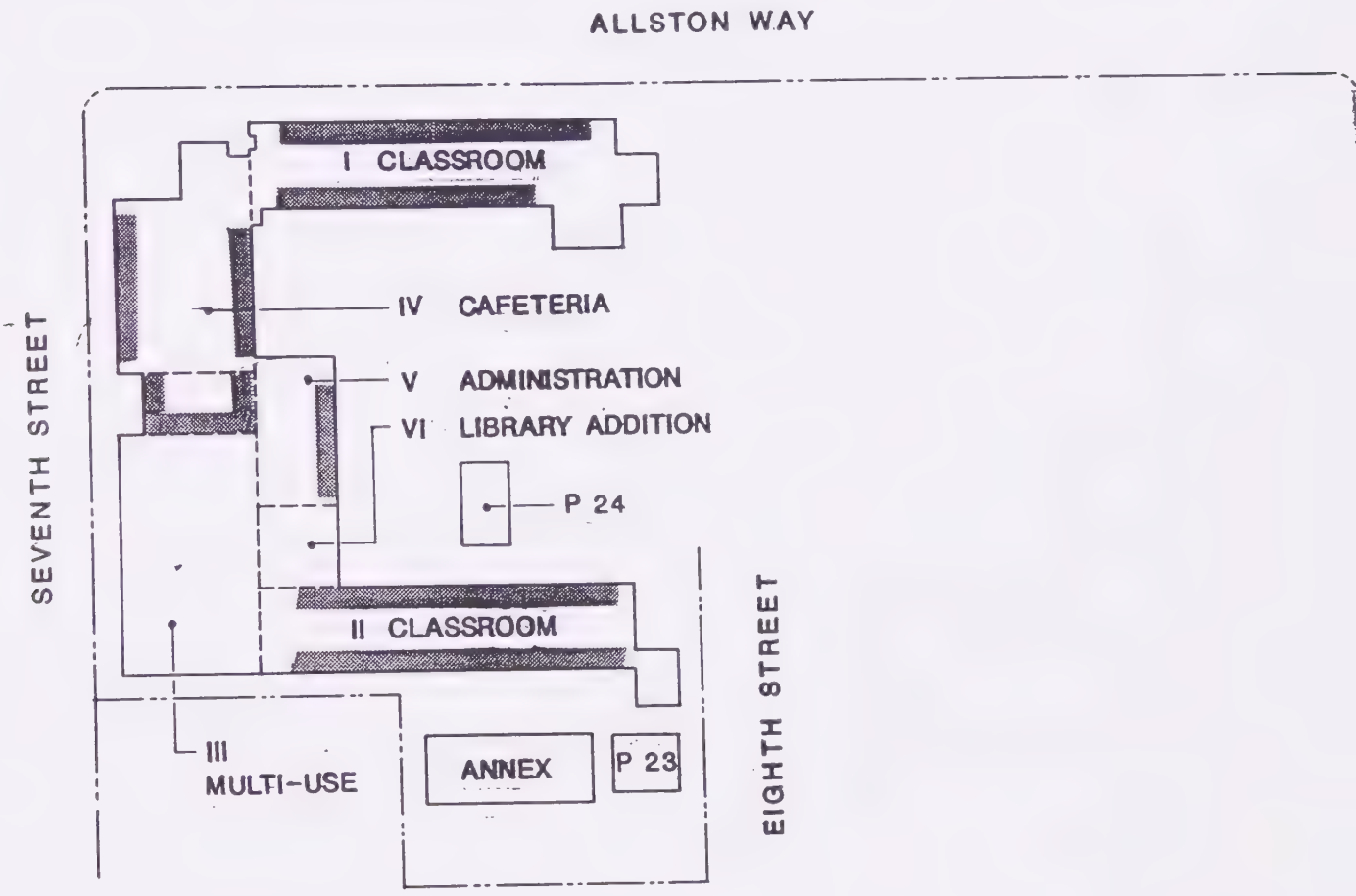
1) Carport under west end has resulted in a vertical irregularity (shearwall is not continuous to foundation);
2) Problems associated with torsion may result and;
3) Columns supporting west end of building do not meet ductility requirements.

A more detailed analysis showed the above suspected deficiencies to be adequate with the exception that the columns supporting the west end of the library do not meet ductility requirements. However, the drifts to which the columns will be subjected are not expected to cause the columns to fracture.

SCHOOL: **COLUMBUS**

LOCATION: Seventh Street between Allston Way and Bancroft Street

DATE OF CONSTRUCTION: Original construction demolished.
Main classroom building and kindergarten annex built 1953.
Library addition 1963.



INDICATES AREAS WHERE HAZARD POTENTIAL HAS BEEN NOTED

SITE PLAN

40 0 80
20 40

COLUMBUS

For purposes of evaluation the school has been divided into six elements as shown on the accompanying sketch. The construction is generally concrete and steel. The classroom wings are two-story elements with transverse concrete shear walls and longitudinal moment-resisting frames. The multi-use wing is a tall one-story element with concrete walls and steel joists that support a concrete roof slab. The administration wing if a shorter one-story element of similar construction. The cafeteria is similar in construction also, except it has moment-resisting frames in one direction. The library addition is a single-story concrete moment frame element, with a concrete roof slab, that is structurally isolated from the surrounding construction. The responses to the ATC-22 Evaluation Statements and follow up analyses indicate the following:

CLASSROOM WINGS - ELEMENTS I AND II

EVENT	RATING	REMARKS
Full Collapse	Low Probability	Low hazard potential. Steel columns will prevent collapse.
Partial Collapse	Moderate Probability	Moderate hazard potential. Possible loss of support at certain columns.
Component Failure	High Probability	High hazard potential. Possible fracturing of concrete at beam-column connection.
Blocked Entrance	Moderate Probability	Moderate hazard potential. Falling debris could impair egress.

CLASSROOM WINGS

Two-story building with concrete shearwalls in the transverse direction at east and west ends, and moment-resisting frames constructed with steel columns and reinforced concrete beams along north and south walls in the longitudinal direction. Roof and floor structures consists of open web steel joists with reinforced concrete slabs.

Evaluation Statements revealed the following deficiencies:

1) Building drift is excessive;
2) Column moment capacity is less than beam moment capacity;

3) Beam stirrups are not properly anchored;
4) Beam stirrup spacing is excessive;
5) Steel columns do not meet compact member requirements;
6) Beam to column connections do not qualify as moment connections for special moment frames;
7) Diaphragm shear connections to steel beams are deficient.

All of the foregoing deficiencies are for lateral loads in the longitudinal direction. Deficiencies in the transverse direction were limited to insufficient reinforcing around openings. Although not revealed as a deficiency by the evaluation statements, the overturning characteristics of the transverse shear walls were evaluated.

All items were found to be satisfactory by detailed analysis except the following:

a) 1st Floor column bending at column-beam joint (longitudinal) D/C = 2.79.
b) 2nd Floor column bending at column-beam joint (longitudinal) D/C = 1.62.
c) Roof beam bending at beam-column joint (longitudinal direction) D/C = 1.31
d) Shear wall overturning D/C = 1.7

Discussion:

Steel columns and concrete beams make up to the moment-resisting frames that resist earthquake loads in the longitudinal (east-west) direction. The steel columns, although highly overstressed, will prevent collapse but significant damage may occur. There is a high probability of component failure where fracturing of concrete at the beam-column location could result in localized falling hazards (pieces of concrete up to volleyball size). Debris from shattered concrete could impair circulation in the corridors.

MULTI-USE - ELEMENT III

EVENT	RATING	REMARKS
Full Collapse	Not Probable	
Partial Collapse	Not Probable	
Component Failure	Low Probability	Low hazard potential from fall debris.
Blocked Entrance	Not Probable	

MULTI-USE

One story reinforced concrete bearing and shear wall building. Slab-on-grade floor with open web steel joist roof framing supporting a reinforced concrete slab.

Evaluation statements revealed the following deficiencies:

1) Insufficient reinforcing around wall openings;
2) Plan irregularity at connection between Multi-use unit and Cafeteria lobby.

All items were found to be satisfactory by detailed analysis except the lobby roof connection could distort the north wall of multi-use unit. D/C = 1.78 for wall bending.

Discussion:

Cracking and distortion of concrete is possible at the lobby roof slab connection to the north wall of the multi-use room. No collapse or falling debris is anticipated.

CAFETERIA - ELEMENT IV

EVENT	RATING	REMARKS
Full Collapse	Low Probability	Low hazard potential. Steel columns will prevent collapse.
Partial Collapse	Moderate Probability	Moderate hazard potential. Possible loss of support at certain columns.
Component Failure	High Probability	High hazard potential. Possible fracturing of concrete at beam-column connection.
Block Entrance	High Probability	Moderate hazard potential. Falling debris could impair egress.

CAFETERIA

One story reinforced concrete shear wall building in transverse direction, and combined steel and reinforced concrete frame in the longitudinal direction, as described for Elements I and II. Basement under north half of the building, partially above-grade.

Open web steel joist roof framing support a reinforced concrete slab. Floor structure at basement area is reinforced concrete beam and slab construction.

Evaluation Statements revealed the following deficiencies:

1) Building drift is excessive;
2) Column moment capacity is less than beam moment capacity;
3) Beam stirrups are not properly anchored;
4) Beam stirrup spacing is excessive;
5) Steel columns do not meet compact member requirements;
6) Beam to column connections do not qualify as moment connections for special moment frames;
7) Diaphragm shear connections to steel beams are deficient.

All of the foregoing deficiencies are for lateral loads in the longitudinal direction. Deficiencies in the transverse direction were limited to insufficient reinforcing at around openings.

All items were found to be satisfactory by detailed analysis except:

a) 1st Floor column bending at column-beam joint (longitudinal) D/C=1.09.
b) Wall bending between lobby and multi use unit D/C = 1.78.
c) Roof beam bending at beam-column joint (longitudinal direction) D/C = 3.22.

Discussion:

Steel columns and concrete beams make up the moment-resisting frames that resist earthquake loads in the longitudinal (north-south) direction. The steel columns, although highly overstressed, will prevent collapse but significant damage may occur. There is a high probability of component failure where fracturing of concrete at the beam-column location could result in localized falling hazards (pieces of concrete up to volleyball size). Debris from shattered concrete could impair circulation in the corridors.

ADMINISTRATION - ELEMENT V

EVENT	RATING	REMARKS
Full Collapse	Low Probability	Low hazard potential due to shear wall construction.
Partial Collapse	Low to Moderate Probability	Moderate hazard potential. Possible loss of support at certain columns.
Component Failure	High Probability	High hazard potential. Possible fracturing of concrete at wall-beam joint.
Blocked Entrance	Not Probable	---

ADMINISTRATION

One story reinforced concrete bearing and shear wall building. Slab-on-grade floor with open web steel joist roof framing supporting a reinforced concrete slab.

Evaluation statements revealed the following deficiencies:

1) Lack of confinement reinforcing in shear wall boundary elements;
2) Insufficient reinforcing around wall openings;
3) Lack of shear reinforcing in coupling beams. Although not revealed as a deficiency by the evaluation statements, shear wall overturning and coupling beam bending were evaluated.

All items were found to be satisfactory by detailed analysis except:

a) High overturning force at the longitudinal east side wall with overturning D/C=4.0
b) Coupling beam bending (longitudinal) D/C=2.05

Discussion:

Shear wall construction reduces the possibility of full collapse, however the high overturning forces to which the shear walls may be subjected could cause them to distort and fracture. Movement associated with this distress could result in loss of support at certain column locations and/or fracturing of concrete beam elements that frame to the wall, with the attendant possibility of localized falling debris (pieces of concrete up to volleyball size). Vulnerable components are not located at entrances or exits so egress would not be impaired.

LIBRARY ADDITION - ELEMENT VI

EVENT	RATING	REMARKS
Full Collapse	Not Probable	
Partial Collapse	Not Probable	
Component Failure	Not Probable	
Blocked Entrance	Not Probable	

LIBRARY ADDITION

One story conventionally reinforced concrete frame building with reinforced concrete waffle slab at roof. Support for slab provided by four 20"x20" reinforced concrete columns. Frame beams are integral with waffle slab.

Evaluation statements revealed the following deficiencies:

1) Column shear capacity is not sufficient to develop moment capacity;
2) Column moment capacity is less than beam moment capacity;
3) Column tie spacing is excessive;
4) Stirrups and ties are not anchored properly;
5) Beam stirrup spacing is excessive.

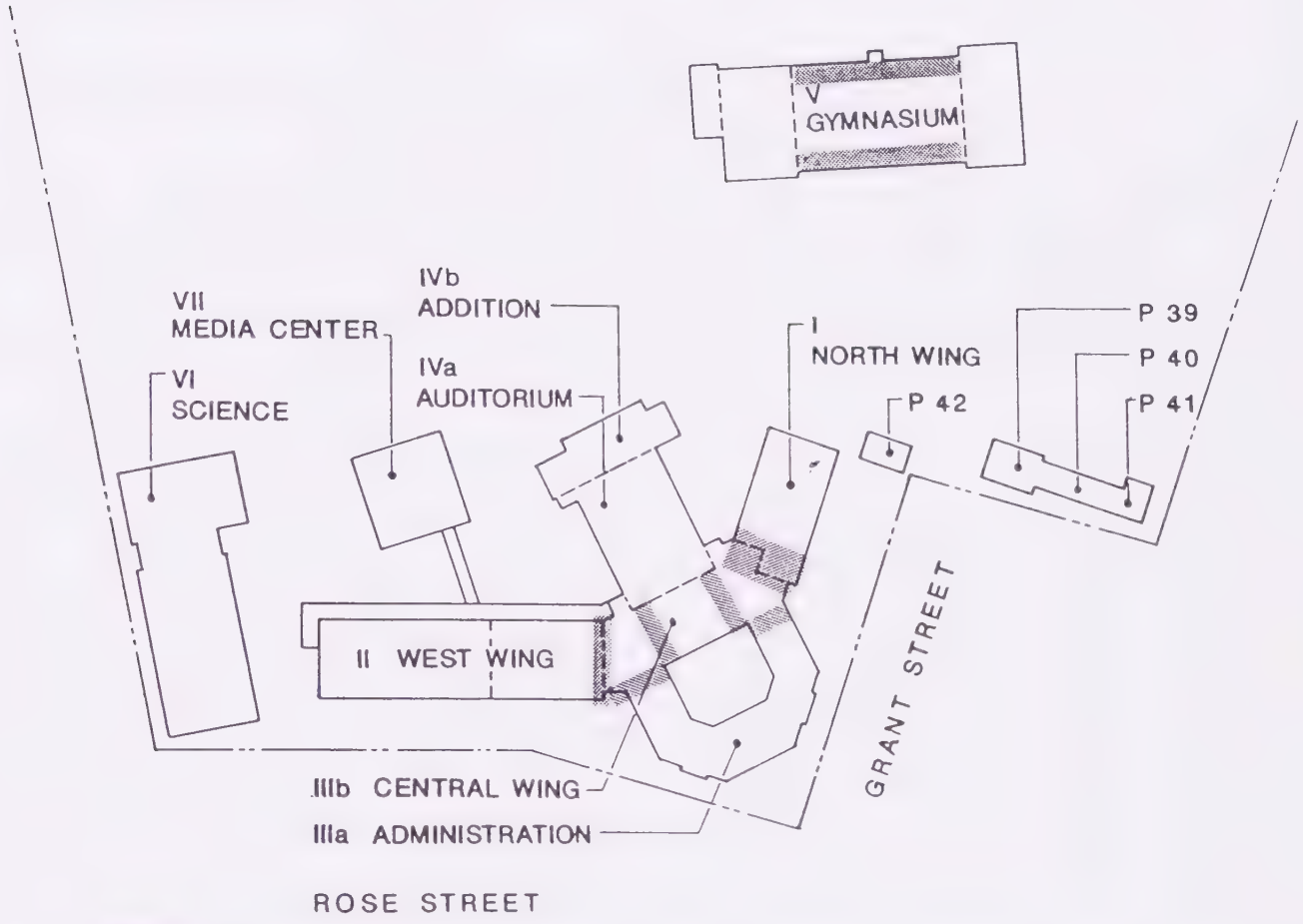
Even though this type of construction is characterized as a brittle frame structure and is no longer permitted by Code, detailed analysis determined that the structure meets ATC-22 acceptance criteria.

SCHOOL: **MARTIN LUTHER KING JUNIOR HIGH**

LOCATION: Rose Street between Carlotta Avenue and Grant Street

DATE OF CONSTRUCTION: Classroom building originally constructed 1920.
Auditorium constructed 1923.
West wing addition constructed 1928.
Entire building rehabilitated 1937.

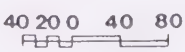
I. Classroom North Wing
II. Classroom West Wing
III. Administration IIIa and Central Classroom Wing IIIb
IV. Auditorium, IVa; Auditorium Addition IVb
V. Gymnasium, constructed 1955
VI. Science Building - constructed 1965
VII. Media Center - constructed 1980



INDICATES AREAS WHERE HAZARD POTENTIAL HAS BEEN NOTED

SITE PLAN

MARTIN LUTHER KING JUNIOR HIGH - 1



MARTIN LUTHER KING JR. HIGH

For the purpose of this evaluation, the school has been divided into seven elements as shown on the accompanying sketch.

The main classroom building (Elements I, II and III) is a one and two story structure, generally of wood frame construction, with a full basement under the north and west wings.

The auditorium (Element IV) is a tall one-story structure with concrete walls, steel roof trusses and wood joists; while the addition is a two-story concrete structure with steel roof trusses and concrete slab roof.

The gymnasium (Element V) is a tall one-story building with lower locker room elements on each side. The building has concrete walls with wood and steel roof framing.

The science building (Element VI) is a one-story building with concrete wall panels and wood framed roof and floor construction.

The media center (Element VII) is a two-story wood frame building with a steel moment frame covered walkway connecting it to the classroom building.

All ratings which follow are based on the assumption that wood framing and sheathing hidden from view is in good condition. Areas that are accessible, and/or areas where outward signs of wood deterioration is manifest, have been investigated by the Wood Building Research Center of the University of California. Their report follows the evaluation reports of the individual school sites. The responses to the ATC-22 Evaluation Statements and follow-up analyses indicate the following:

CLASSROOM NORTH WING - ELEMENT I

EVENT	RATING	REMARKS
Full Collapse	Not Probable	-----
Partial Collapse	Not Probable	-----
Component Failure	Moderate Probability	Moderate hazard potential from falling debris.
Blocked Entrance	Not Probable	-----

CLASSROOM NORTH WING

The building is a pre-Field Act, two story classroom building with a partially improved crawl space, reconstructed in 1937 to meet Field Act requirements.

Reconstruction included removal and replacement of unreinforced masonry exterior walls with diagonally sheathed wood framed shear walls. Horizontal bracing was added at the second floor ceiling level (below roof) for lateral bracing. First and second floor diagonal sheathing was renailed to existing framing for diaphragm action. New exterior reinforced concrete footings and walls were added to first floor level. Some new interior reinforced concrete shear wall footings were added and a new reinforced concrete slab on grade was placed. Vertical steel bracing trusses were added at basement level below new interior shear walls.

Evaluation statements revealed the following suspected deficiencies:

1) Some shear walls do not satisfy the shear stress quick check;
2) Shear walls are not sheathed with plywood;
3) Reinforced concrete shear walls have poor height to length ratios;
4) Lack of confinement reinforcing in reinforced concrete shear wall boundary elements and insufficient reinforcing around wall openings;
5) The joint connections at steel braced frame are not able to develop yield capacity of bracing members;
6) Plan irregularity at connection between north wing and two story classroom at auditorium area.

All items were found to be satisfactory by detailed analysis except:

a) Wood partition shear walls at 2nd floor are overstressed D/C = 1.04. This calculated overstress is not significant.

Discussion:

Wall and horizontal diaphragm elements may experience cracking and/or tearing at joint between the north wing and the central classroom wing (plan irregularity) which could result in falling debris.

CLASSROOM WEST WING - ELEMENT II

EVENT	RATING	REMARKS
Full Collapse	Not Probable	-----
Partial Collapse	Not Probable	-----
Component Failure	Moderate Probability	Moderate hazard potential from falling debris.
Blocked Entrance	Not Probable	-----

CLASSROOM WEST WING

This building is also a pre-Field Act structure consisting of two parts which will be designated east classroom portion and west classroom portion. The two portions are separated by a reinforced concrete stairwell. The west portion is a one story classroom building with a non-improved full basement and a partial sub-basement under one third of the west side of the building. The east portion is a two story classroom building with an improved, partially above grade, full basement. The building was reconstructed in 1937 to meet Field Act requirements.

Reconstruction included removal and replacement of unreinforced masonry exterior walls with diagonally sheathed wood framed shear walls. Certain interior partitions were diagonally sheathed to act as shear walls. Horizontal wood bracing trusses were added at the upper floor ceiling level (below roof) for both portions and a horizontal steel bracing truss was added at the first floor level (basement ceiling) for the west portion of the building. All trusses were added for lateral bracing.

All floor diagonal sheathing was renailed to existing framing for diaphragm action. New exterior reinforced concrete footings and walls were added at basement level and first floor level for the west and east portions respectively. Some new interior reinforced concrete shear wall footings were added and a new reinforced concrete slab-on-grade was placed. Vertical steel bracing truss and portal frames were added at the basement level.

Evaluation statements revealed the following deficiencies:

1) Some shear walls do not satisfy the shear stress quick check;
2) Shear walls are not sheathed with plywood;
3) Some shear walls are not constructed with holdowns;
4) Some reinforced concrete shear walls have poor height to length ratios;
5) Lack of confinement reinforcing in shear wall boundary elements and insufficient reinforcing around wall openings;
6) Lack of shear reinforcing in coupling beams;
7) Diagonal bracing for steel braced frames does not satisfy the quick check for stress;
8) The joint connections of steel braced frames are not able to develop yield capacity of bracing members;
9) Steel beams and columns do not meet compact member requirements;
10) Beam to column connections do not qualify as moment connections for special moment frames;
11) Plan irregularity at connection between west wing and two story classroom at auditorium area.

All items were found to be satisfactory by detailed analysis except:

a) Wood partition shear wall in the east portion of the second floor is overstressed D/C = 1.06.

This calculated overstress is not significant.

Discussion:

Wall and horizontal diaphragm elements may experience cracking and/or tearing at joint between the west wing and the central classroom wing (plan irregularity) which could result in falling debris.

ADMINISTRATION AND CLASSROOM CENTRAL WING - ELEMENTS IIIa AND IIIb

EVENT	RATING	REMARKS
Full Collapse	Not Probable	-----
Partial Collapse	Not Probable	-----
Component Failure	Moderate Probability	Moderate hazard potential from falling debris.
Blocked Entrance	Not Probable	-----

ADMINISTRATION

This building is a pre-Field Act one story building reconstructed in 1937 to meet Field Act requirements.

Reconstruction included removal and replacement of unreinforced masonry exterior walls with diagonally sheathed wood framed shear walls. Selected interior partitions were diagonally sheathed to act as shear walls. A horizontal wood bracing truss was added at ceiling level (below roof) for lateral force bracing. Floor diagonal sheathing was renailed to existing framing for diaphragm action. New exterior reinforced concrete footings and reinforced concrete walls were added to the underslate of the floor level.

Evaluation statements revealed the following suspected deficiencies:

1) Wood shear walls are not sheathed with plywood and not constructed with holdowns at panel ends.

All items were found to be satisfactory by detailed analysis.

Discussion:

Wall and horizontal diaphragm elements may experience cracking and/or tearing at joint between the one-story administration portion and the two-story central classroom portion, which could result in falling debris.

CLASSROOM CENTRAL WING

This portion of the classroom structure was part of the original construction and, like the classroom wings on either side, was reconstructed in 1937 to Field Act Standards. The reconstruction employed the same materials and techniques as was used for the adjacent

wings. It is two stories over an unimproved, tall crawl-space area.

Evaluation statements revealed the following deficiencies:

1) Shear walls are not continuous to the foundation;
2) Shear walls do not satisfy the shear stress quick check;
3) Shear walls are not sheathed with plywood;
4) Shear walls are not constructed with holdowns;

Although not revealed as a deficiency by the evaluation statements, the horizontal wood bracing truss at the upper floor ceiling level was evaluated for adequacy.

All items were found to be satisfactory by detailed analysis except:

a) Wood shear walls between classrooms at the first floor level do not have cripple walls nor foundations through the crawl space.

Discussion:

Walls and horizontal diaphragms may experience cracking and/or tearing at the shear walls that are not continuous to the foundation.

AUDITORIUM AND AUDITORIUM ADDITIONAL - ELEMENTS IVa AND IVb

EVENT	RATING	REMARKS
Full Collapse	Not Probable	----
Partial Collapse	Not Probable	----
Component Collapse	Not Probable	----
Blocked Entrance	Not Probable	----

AUDITORIUM

This building is a pre-Field Act, structure reconstructed in 1937 to meet Field Act requirements. It was modified again in 1951. The auditorium is a tall one story reinforced concrete building with a partial basement under the stage. There is an improved balcony over one third of the area at the south part of the auditorium.

Reconstruction on the auditorium building included filling of some openings around the auditorium exterior wall with reinforced concrete infill and, for lateral force bracing, the addition of horizontal steel bracing trusses at bottom chord of roof structure, below the balcony floor and below the stage floor joists.

AUDITORIUM ADDITION

The 1951 remodeling included the addition of a new stage (platform) and a classroom (small studio), with a partially above grade full basement. A reinforced concrete slab-on-grade was placed at the new basement floor.

The Evaluation Statements revealed the following deficiencies:

1) The auditorium roof is not sheathed with plywood.

This was found to be satisfactory by detailed analysis.

GYMNASIUM - ELEMENT V

EVENT	RATING	REMARKS
Full Collapse	Not Probable	----
Partial Collapse	Not Probable	----
Component Failure	High Probability	Moderate hazard potential from falling glass.
Blocked Entrance	Not Probable	----

GYMNASIUM

The building is a tall one story reinforced concrete bearing and shear wall structure flanked by lower locker rooms on each side. It has a reinforced concrete slab-on-grade floor. The gymnasium roof construction consists of 2" T & G wood decking and wood joists on steel framing. Horizontal diaphragm action at the roof level is provided by a steel angle bracing system around the perimeter of the high roof. This roof diaphragm is connected directly to the concrete walls on the east and west sides, but is braced through the clearstory windows at the north and south walls by means of diagonal braces to the top of the reinforced concrete walls below.

The locker room roof construction consists of 1" diagonal sheathing and wood joists supported by steel beams. Horizontal diaphragm action at the roof level is provided by a steel angle bracing system that connects directly to the reinforced concrete walls on all sides.

Evaluation statements revealed the following deficiencies:

1) Reinforced concrete shear walls are not continuous to the roof diaphragm at north and south walls;
2) Inadequate connection between roof diaphragm and shear walls.

All items were found to be satisfactory by detailed analysis except:

a) Steel diagonal bracing between the roof diaphragm and tops of concrete shear walls at clearstory windows are overstressed. D/C = 1.46.

Discussion:

Window glass breakage is possible due to excessive drift at north and south walls.

SCIENCE BUILDING - ELEMENT VI

EVENT	RATING	REMARKS
Full Collapse	Not Probable	-----
Partial Collapse	Not Probable	-----
Component Failure	Not Probable	----
Blocked Entrance	Not Probable	-----

SCIENCE BUILDING

One story building with tilt-up reinforced concrete wall panels, wood framed roof and floor and reinforced concrete drilled piers and grade beam foundation system. The roof and floor horizontal diaphragms, as well as the wood interior shearwalls, are sheathed with plywood.

All evaluation statements were found to be true.

This building is judged to have no deficiencies.

MEDIA CENTER - ELEMENT VII

EVENT	RATING	REMARKS
Full Collapse	Not Probable	-----
Partial Collapse	Not Probable	-----
Component Failure	Not Probable	-----
Blocked Entrance	Not Probable	-----

MEDIA CENTER

Two story wood framed bearing wall building with plywood sheathed horizontal diaphragms and plywood sheathed shear walls. It is connected to the main building with a two story covered walkway of steel moment frame construction.

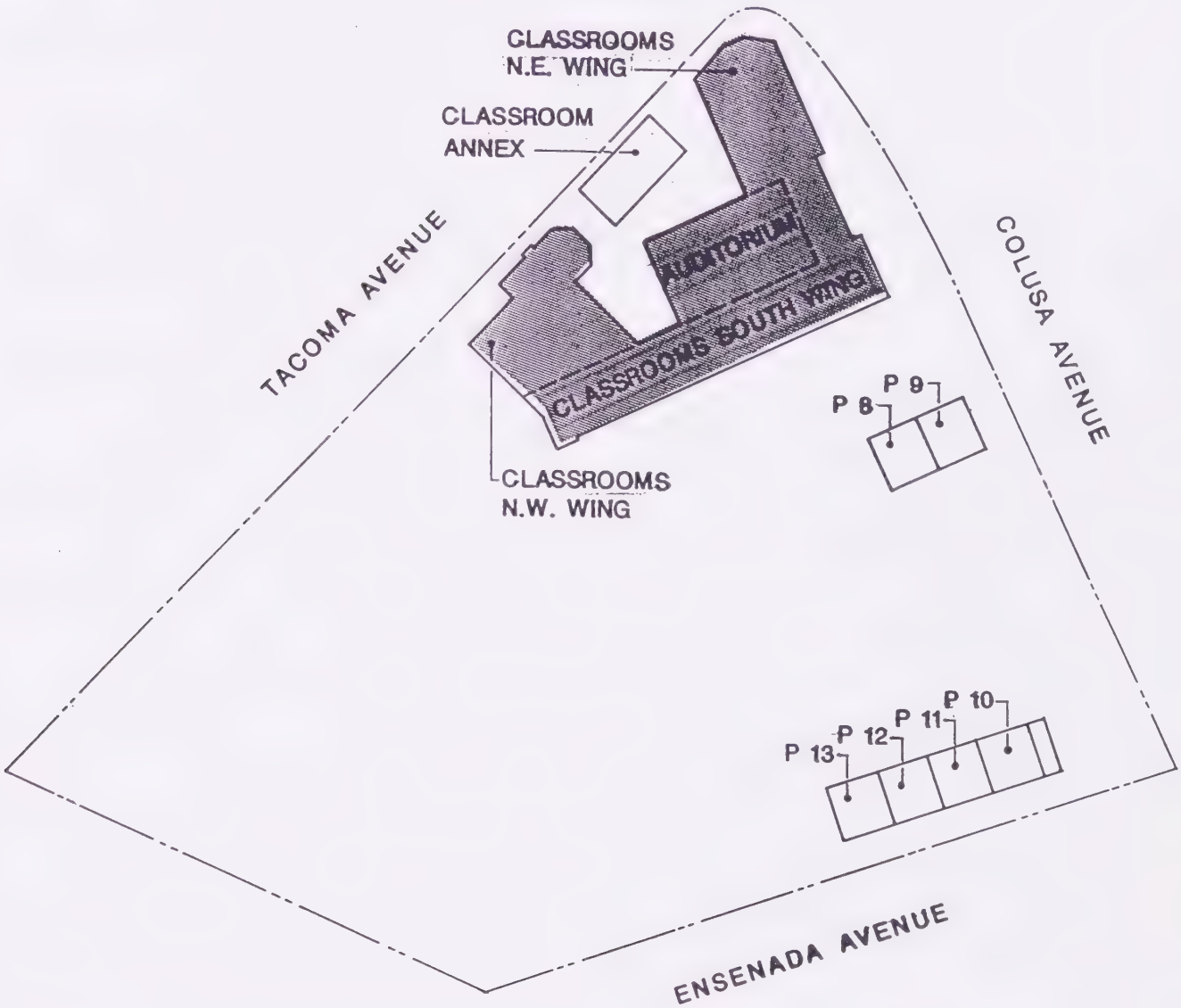
All evaluation statements were found to be true.

This building is judged to have no deficiencies.

SCHOOL: **THOUSAND OAKS**

LOCATION: Corner Colusa and Tacoma Avenue

DATE OF CONSTRUCTION: Original (main) building rehabilitated 1934.
Classroom addition 1964.



INDICATES AREAS WHERE HAZARD POTENTIAL HAS BEEN NOTED

SITE PLAN

40 20 0 40 80

0246HO

THOUSAND OAKS

Thousand Oaks School, constructed in 1913 prior to the Field Act, originally consisted of unreinforced masonry exterior walls supporting wood framed floors, roof and interior partitions. Reconstruction in 1937, to conform to Field Act requirements, resulted in removal of unreinforced masonry walls and replacement with wood framing. Since that time, an additional story has been added to the south classroom wing, and a new Classroom Annex Building has been constructed in the area immediately northwest of the auditorium.

Information for this evaluation was based on site observation and study of a partial set (2 sheets) of work drawings.

All ratings which follow are based of the assumption that wood framing and sheathing hidden from view is in good condition. Areas that are accessible, and/or areas where outward signs of wood deterioration is manifest, have been investigated by the Wood Building Research Center of the University of California. Their report follows the evaluation reports of the individual school sites. The responses to the ATC-22 Evaluation Statements and follow-up analyses indicate the following:

MAIN BUILDING - CLASSROOMS AND AUDITORIUM

EVENT	RATING	REMARKS
Full Collapse	Low Probability	Low hazard potential due to shear wall construction.
Partial Collapse	Moderate Probability	High hazard potential. Walls lack strength and stability.
Component Failure	High Probability	High hazard potential. Some walls and connections could be stressed to failure.
Blocked Entrance	Moderate Probability	High hazard potential. Falling debris could impair egress.

MAIN BUILDING

The building consists of four segments: the south classroom wing; the auditorium; the northwest classroom wing; and the northeast classroom wing. The south classroom wing is a three story structure with slab on grade and concrete walls from basement to first floor, and wood framed walls, floors, and roof above. Wood trusses support clay tile roofing over straight sheathing. Because the site slopes toward the west, the south classroom wing consists of 2 levels on the east end and 2 levels plus a basement at the west end. Basement level

opens onto a playground on the south and west sides. East-west lateral load resisting system consists of straight sheathed roof and walls, and diagonally sheathed floors. North-south lateral system consists of diagonally sheathed walls from the first floor to the roof and a vertical wood bracing truss from first floor to basement. The roof is laterally supported by horizontal wood bracing trusses attached to the bottom chord of the roof trusses.

The auditorium is a tall one story wood framed structure with clay tile roof over straight sheathing supported by wood joists and large wood trusses. East-west lateral system consists of horizontal wood bracing truss carrying ceiling and roof loads to a diagonally sheathed wall on the north side and a straight sheathed wall, shared with the south classroom wing, on the south side. North-south lateral loads are dragged through a horizontal steel truss from the auditorium roof into diagonally sheathed walls of south classroom wing noted above.

The northeast classroom wing is a one story wood framed structure with a built-up roof supported by heavy ceiling framing. Interior wood framed bearing walls are supported on wood floor framing. The lateral load resisting system consists of a diagonally sheathed roof supported on three sides by straight sheathed exterior walls with many openings. The fourth side, shared with the auditorium to the south, is diagonally sheathed.

The northeast classroom wing is a one story wood framed structure with a built-up roof supported by heavy ceiling framing. Interior wood framed bearing walls are supported on wood floor framing. The lateral load resisting system consists of a diagonally sheathed roof supported on three sides by straight sheathed exterior walls with many openings. The fourth side, shared with the auditorium to the south, is diagonally sheathed.

The northwest classroom wing is similar to the northeast classroom wing with the following exceptions: a) Steel framing and bracing have been added below the main floor at interior bearing lines in a two story area created by a partial basement; b) Diagonal sheathing has been added to a division wall between the one and two story areas; c) No sheathing exists on the south wall.

Evaluation Statements revealed the following deficiencies:

1. A quick check on shear wall stresses indicated insufficient wall strengths in both directions of every wing.

2. Many of the walls supporting significant floor areas lack sufficient stability with respect to overturning, as well as strength.

3. All floor diaphragms consist of straight or diagonal sheathing, which often lack sufficient strength and stiffness to safely transfer seismic loads to wall elements.

4. The south classroom wing roof is split level between classrooms and corridor, which results in special framing requirements for east/west loading.

5. Many cripple walls lack adequate sheathing.

6. Wood posts at the foundation level are not adequately attached to foundation elements.

7. Various wings of the building are not adequately tied together.

Detailed analysis confirmed the following deficiencies:

1. Insufficient shearwall strength throughout the building (Demand/Capacity ratios as high as 4.67).

2. Shearwalls lack stability (resistance to overturning).

3. Insufficiently sheathed cripple walls.

4. Posts insufficiently attached to foundation elements.

5. Inadequate structural ties between various wings of the structure.

Discussion:

Redundancy and number of non-structural, as well as structural walls will prevent collapse, but extensive damage is expected. We judge the probability of total collapse is low, but there exists a possibility of for partial collapse. There is a high probability for component failure where certain walls and connections will likely be stressed to failure. Partial collapse and/or component failure presents a potentially hazardous condition due to falling debris, which could also impair egress from the building.

CLASSROOM ANNEX

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Not Probable	---
Component Failure	Not Probable	---
Blocked Entrance	Not Probable	---

CLASSROOM ANNEX

The Classroom Annex Building, constructed in 1964, is a one story wood framed structure with built-up roof and floor slab-on-grade. Both vertical and horizontal diaphragms are sheathed with plywood.

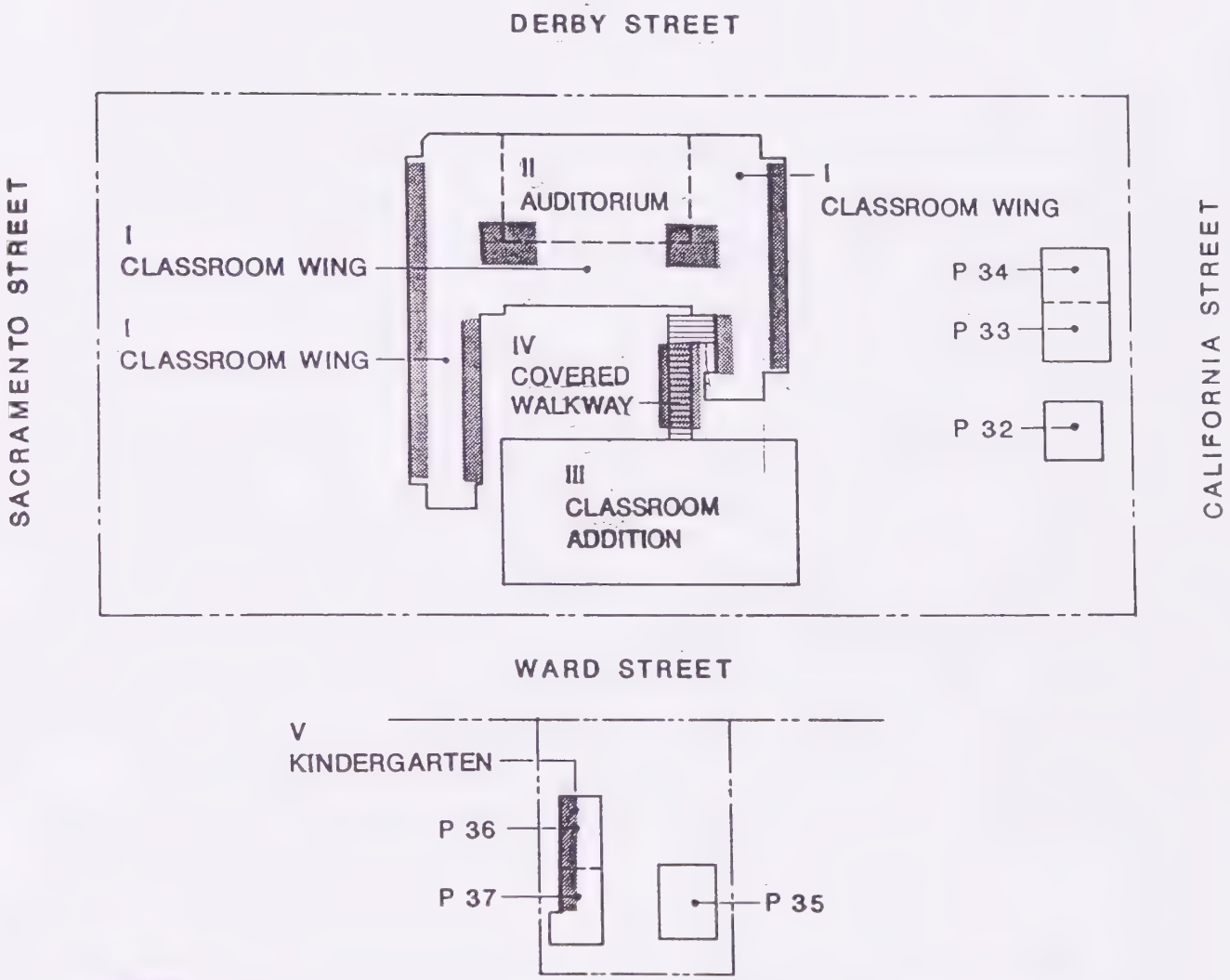
The building has a well defined and constructed lateral force resisting system.

Evaluation statements for this structure indicate no structural deficiencies.

SCHOOL: **LONGFELLOW**

LOCATION: Derby Street between Sacramento and California Streets

DATE OF CONSTRUCTION: Original (main) building rehabilitated 1935.
Kindergarten building addition constructed 1958.
Classroom building addition constructed 1963.



SITE PLAN

40 20 0 40 80

LONGFELLOW

For purposes of evaluation the school has been divided into five elements as indicated on the accompanying sketch. The three classroom wings, designated as Element I, are two stories of wood frame construction above reinforced concrete walls at the basement level. The tall single story auditorium has full height reinforced concrete walls that support a steel truss, wood purlin and joist roof system.

The classroom addition, element III, is a separate one story wood frame building with plywood sheathed roof and walls. The covered walkway structure, Element IV, that connects the addition to the main building, consists of steel columns that support a wood framed roof.

The Kindergarten, Element V, is a separate one story wood frame building with plywood sheathed roof and walls.

All ratings which follow are based on the assumption that wood framing and sheathing hidden from view is in good condition. Areas that are accessible, and/or areas where outward signs of wood deterioration is manifest, have been investigated by the Wood Building Research Center of the University of California. Their report follows the evaluation reports of the individual school sites. The responses to the ATC-22 Evaluation Statements and follow-up analyses indicate the following:

MAIN BUILDING - ELEMENTS I AND II

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Not Probable	---
Component Failure	Low to Moderate Probability	Low hazard potential from falling debris.
Blocked Entrance	Low Probability	Falling debris could impair egress. Low hazard potential.

CLASSROOM WINGS

The main building was rehabilitated in 1935 to conform to Field Act Standards. The classroom wing consists of two story construction above a fully utilized, partially above grade basement. Reconstruction replaced exterior unreinforced masonry walls with reinforced concrete walls at the basement level and diagonally sheathed wood framed walls above. Floor and roof framing remained with added wood horizontal bracing at the ceiling level under the roof. Interior diagonally sheathed shear walls were added as well as steel cross

braces at the basement level. As part of the reconstruction, reinforced concrete stair towers to the second floor were added at the ends of each wing (wood frame above).

AUDITORIUM

Tall single story structure above fully utilized, partially above grade basement. Reconstruction replaced surrounding unreinforced masonry infill walls with full height reinforced concrete walls. Steel column and steel roof and floor beam framing remained. new horizontal steel bracing was added at both levels.

Evaluation Statements revealed the following deficiencies:

1) Vertical irregularities - north/south interior shear walls in the east and west wings are not continuous to the foundation.
2) Plan irregularities - the building configuration is very irregular and lacks adequate intertying between elements.
3) The building fails the shear stress quick check.
4) Classroom wing shear walls are not sheathed with plywood and are constructed without holdowns.
5) Wood posts lack positive connections to the foundation.
6) Boundary reinforcing of the auditorium concrete walls lack both sufficient confinement reinforcing and adequate anchorage to the foundation.
7) Vertical reinforcing of the auditorium walls is not dowelled to the foundation.

Detailed analysis, however, determined that the structure meets ATC-22 acceptance criteria with the following exceptions:

1) Certain diagonally sheathed walls at the classroom lower level are overstressed with a demand/capacity (D/C) ratio of 1.5. Many result in cracking and spalling of finish materials.
2) Geometric irregularities without proper intertying may result in crushing or tearing of horizontal diaphragms at corners and possible loss of vertical support for second floor headers at the southeast and southwest corners of the auditorium. Thus there is a moderate probability for component failure with the possibility of impeded egress.
3) Absence of dowels from the existing foundation to the replacement shear walls results in high than allowable bearing pressures on shear keys and overstress in shear friction. This should not result in hazardous damage.

Discussion:

Lack of intertying of building elements may result in localized loss of support for floor headers and diaphragms, with attendant distress to finishes. Overstressed wood shear walls may exhibit cracking and tearing of finishes. Absence of a positive connection between the foundation and the auditorium walls may result in concrete spalling and minor shifting. We judge the danger from falling debris caused by the above would not constitute a significant hazard.

CLASSROOM ADDITION - ELEMENT III

EVENT	RATING	REMARKS
Full Collapse	Not Probable	----
Partial Collapse	Not Probable	----
Component Failure	Not Probable	----
Blocked Entrance	Not Probable	----

CLASSROOM ADDITION

Separate one story wood framed structure constructed in 1963. The lateral force resisting system consists of a plywood sheathed roof connected to plywood sheathed exterior and interior walls, and a plywood sheathed floor connected to a continuous concrete foundation.

All elements meet the requirements of the seismic evaluation statements. No building collapse or element failure is anticipated.

COVERED WALKWAY - ELEMENT IV

EVENT	RATING	REMARKS
Full Collapse	Not Probable	----
Partial Collapse	Not Probable	----
Component Failure	Not Probable	----
Blocked Entrance	Not Probable	----

COVERED WALKWAY

One story structure constructed in 1963 with the classroom addition, that does not conform to any building type listed in ATC-22. It was considered as an inverted pendulum for analysis. It's construction consists of two rows of steel columns supporting a wood framed roof.

The seismic evaluation statements were not applicable. However, the columns were investigated for bending and drift. The demand-capacity ratio (D/C) for bending stress is 1.15, indicating minor overstress. The D/C for drift is 2.27, which would translate into a lateral movement of the roof of approximately 4 1/2" inches. While excessive, we do not believe collapse or failure will ever occur, but possible permanent lateral set in the columns may occur in a very strong earthquake.

KINDERGARTEN - ELEMENT V

EVENT	RATING	REMARKS
Full Collapse	Not Probable	----
Partial Collapse	Not Probable	----
Component Failure	Not Probable	Low hazard potential from window glass breakage.
Blocked Entrance	Not Probable	----

KINDERGARTEN

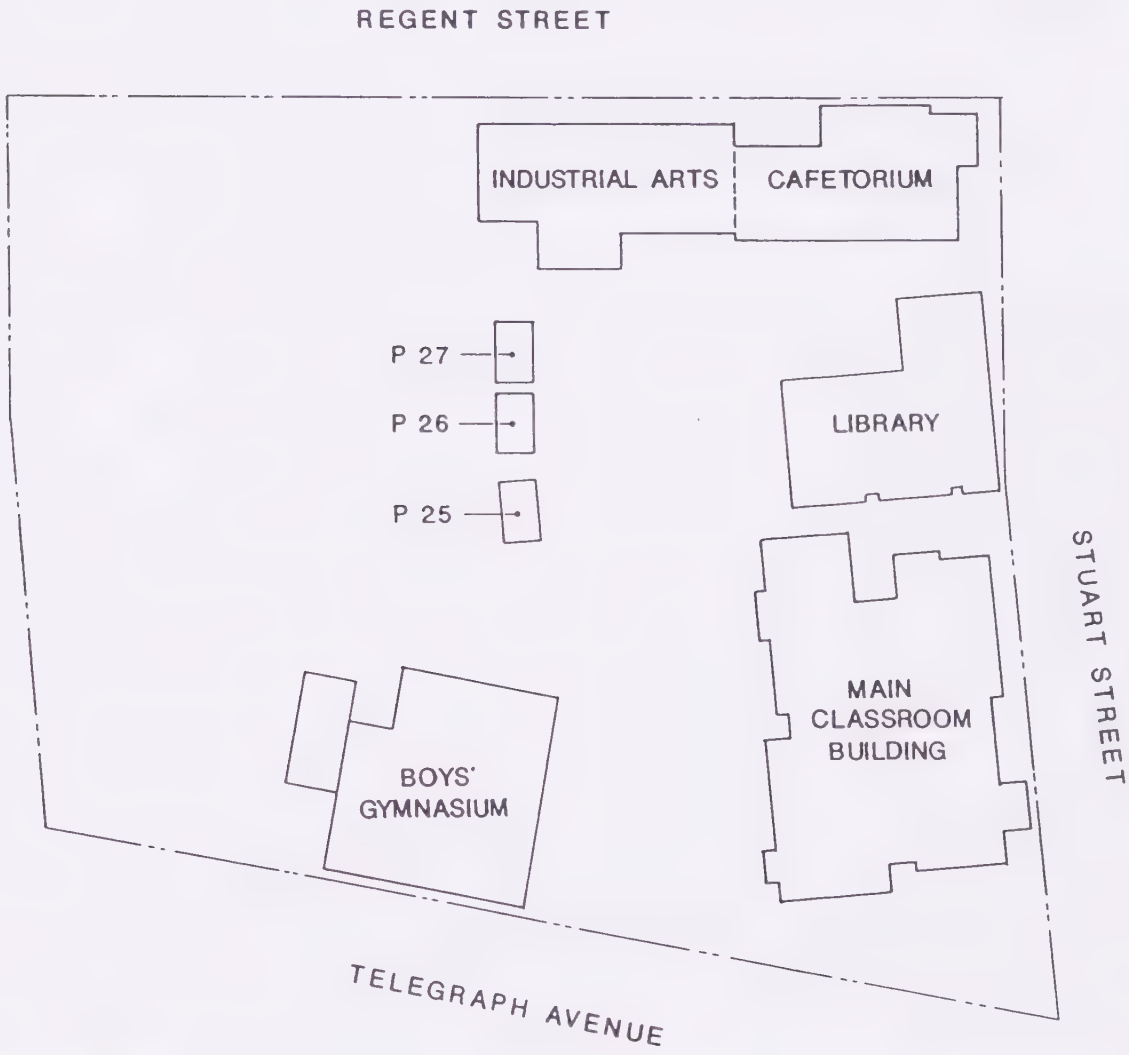
Separate one story, wood frame, slab on grade building constructed circa 1958. Clerestory windows extend the full length of the longitudinal walls. The lateral load resisting system consists of a plywood sheathed roof diaphragm connected to plywood sheathed crosswalls in the transverse direction, and to wood post/mullions that cantilever from the sheathed lower portion of the wall in the longitudinal direction.

All elements meet the requirements of the seismic evaluation statements. However the cantilevered post/mullions were investigated for possible excessive drift (or deflection). The D/C was found to be 1.2, or slightly excessive. We do not expect component failure, but the excessive drift may result in window glass breakage.

SCHOOL: **WILLARD JUNIOR HIGH**

LOCATION: Stuart Street between Telegraph Avenue and Regent Street

DATE OF OBSERVATION: Main classroom building and girl's gymnasium demolished.
New classroom building constructed 1978
Library 1964
Cafetorium 1964
Industrial Arts 1952
Boy's Gymnasium 1952



INDICATES AREAS WHERE HAZARD POTENTIAL HAS BEEN NOTED

SITE PLAN

40 0 80
20 40

WILLARD JUNIOR HIGH - 1

WILLARD JUNIOR HIGH

As indicated on the attached Site Plan, the school consists of five main units. These are:

Library/Administration (Building A)
Classrooms (Building C)
Cafeteria (Cafetorium)
Boy's Gymnasium (Building BG)
Industrial Arts (Building I)

All ratings which follow are based on the assumption that wood framing and sheathing hidden from view is in good condition. Areas that are accessible, and/or areas where outward signs of wood deterioration is manifest, have been investigated by the Wood Building Research Center of the University of California. Their report follows the evaluation reports of the individual school sites. The responses to the ATC-22 Evaluation Statements and follow-up analyses indicate the following:

LIBRARY/ADMINISTRATION - BUILDING A

EVENT	RATINGS	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Not Probable	---
Component Failure	Not Probable	---
Blocked Entrance	Not Probable	---

LIBRARY/ADMINISTRATION

One-story wood frame construction built in 1964.

Roof: wood joists with plywood sheathing.
Walls and partitions: wood studs (with plywood sheathing at shear walls).
Floor: concrete slab-on-grade.
Foundations: continuous concrete footings at exterior walls, bearing and shear walls.

Responses to the applicable Evaluation Statements are all true. No building collapse or component failure is anticipated.

CLASSROOMS - BUILDING C

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Not Probable	---
Component Failure	Not Probable	---
Blocked Entrance	Not Probable	---

CLASSROOM BUILDING

Built in 1978. Expansion joints divide the building into four separate structures, two of two-stories, and two of one story. Roofs, and floors at the two-story units, are of one-way concrete joist and beam construction supported on concrete columns and bearing/shear walls of brick, concrete block, or concrete. All walls are reinforced. Ground floors are concrete slab-on-grade. Exterior walls and shear/bearing walls are supported on continuous concrete footings; columns on isolated concrete footings.

The structure is a hybrid, and does not fall readily into any of the ATC-22 Building Type Classifications. It was assumed, however, that the walls are the critical elements of the seismic resisting system; The Evaluation Statements for Building Type 14 were used for this reason. Responses to the Evaluation Statements were false in two cases: (1) Torsion, and (2) Shearing Stress Check.

A detailed analysis to evaluate the two false responses was made as required by ATC-22. As the design of the classroom building was done by our office, the original calculations were readily available.

The original calculations included torsional effects; the false response in the Evaluation Statements is not considered significant.

A few walls showed Demand/Capacity Ratios (D/C Ratios) in excess of 1.00 in the detailed analysis. These calculated "deficiencies" however are due entirely the differences in code provisions between the 1973 Uniform Building Code which governed the original design, and the modified NEHRP Code specified in ATC-22. The classroom building was carefully designed and detailed, and the drawings/specifications were subjected to a detailed review by the Structural Safety Section - Office of the State Architect. The lateral load carrying system using horizontal concrete diaphragms supported by shear walls is a proven system. Although D/C Ratios for shear walls exceed 1.0 in certain instances we do not believe that hazardous structural failures will result should these "overstresses" occur. No building collapse or component failure is anticipated.

CAFETORIUM - CAF

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Not Probable	---
Component Failure	Not Probable	---
Blocked Entrance	Not Probable	---

CAFETORIUM

Built in 1964. One-story concrete tilt-up construction at cafeteria/auditorium with attached wood frame service rooms and faculty dining room.

Roof: wood joists with plywood sheathing, joists at cafeteria/auditorium supported on steel beams.
Walls and partitions: concrete tilt-up at cafeteria/auditorium, wood studs (with plywood sheathing at shear walls) at other locations.
Floor: concrete slab-on-grade.
Foundations: continuous concrete footings at exterior walls bearing and shear wall.

Response to the applicable Evaluation Statements are true. No building collapse or component failure is anticipated.

BOY'S GYMNASIUM - BUILDING BG

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Not Probable	---
Component Failure	Not Probable	---
Blocked Entrance	Not Probable	---

BOY'S GYMNASIUM

Built in 1952. The gymnasium is a single story concrete structure with varying roof levels. The high roof over the gymnasium is reinforced gypsum on steel purlins supported on steel trusses; The trusses are braced in the plan of the lower chord. Roofs at other locations are of reinforced concrete beams and slabs; floors at other locations are slab-on-grade. Concrete bearing/shear walls and columns are supported on isolated spread footings.

Response to the applicable Evaluation Statements are all true. No building collapse or component failure is anticipated.

INDUSTRIAL ARTS - BUILDING I

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Not Probable	---
Component Failure	Not Probable	---
Blocked Entrance	Not Probable	---

INDUSTRIAL ARTS

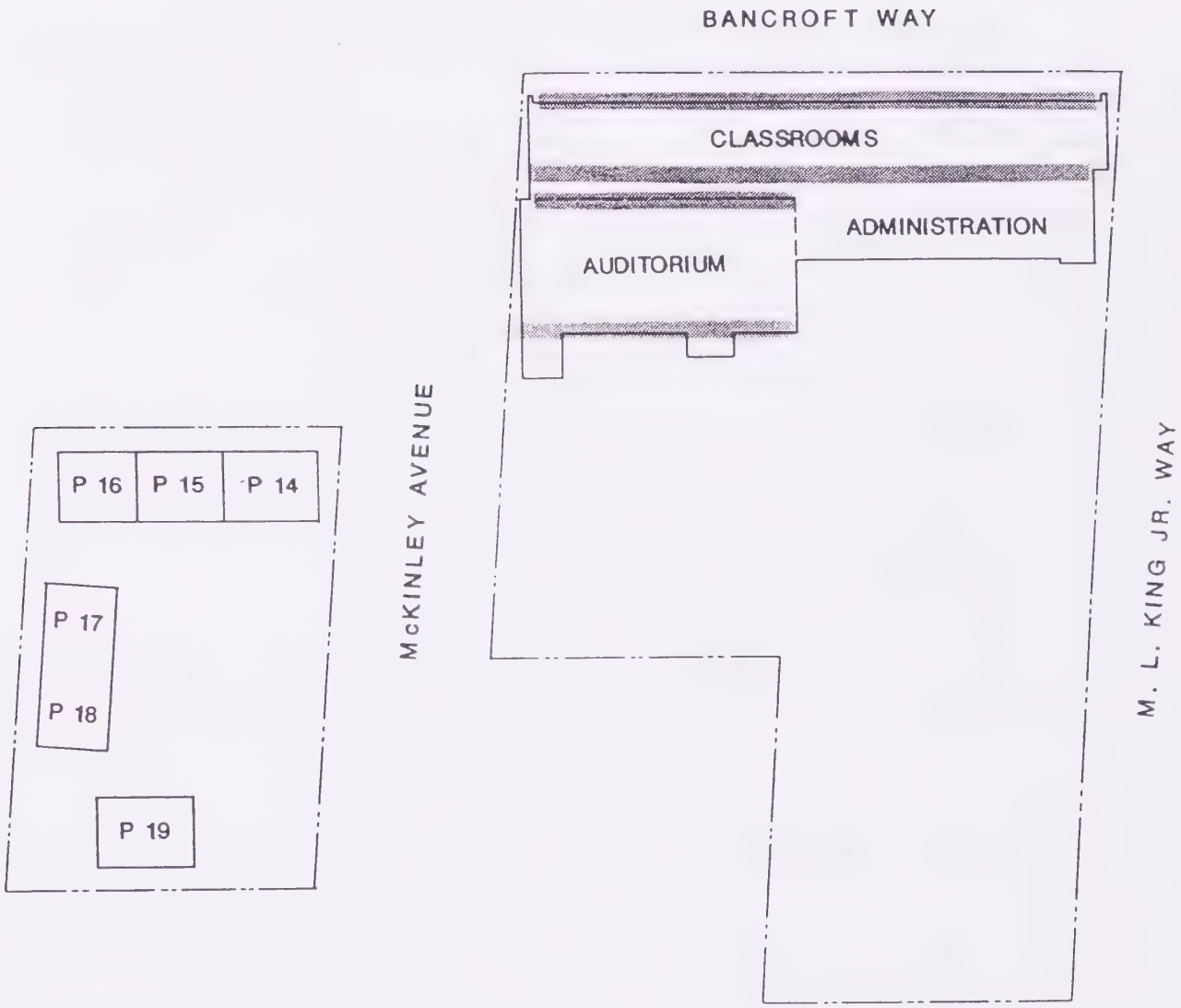
Built in 1952. Single story concrete structure with varying roof levels, 12'-0" high at the crafts room and 18'-6" high at the shops. Roof is reinforced concrete beam and slab with large monitors at both levels. Floor is also reinforced concrete beam and slab. Roof and floor are supported on reinforced concrete walls and columns. Foundation system consists of continuous and spread footings.

Responses to the applicable Evaluation Statements are all true. No building collapse or component failure is anticipated.

SCHOOL: **WASHINGTON**

LOCATION: Corner Bancroft Way and Grove Street

DATE OF CONSTRUCTION: Original building demolished.
New building constructed 1952.



INDICATES AREAS WHERE HAZARD POTENTIAL HAS BEEN NOTED

SITE PLAN

40 20 0 40 80

WASHINGTON

The school building is an all reinforced concrete structure. The west end of the building is an occupied ground floor level under the tall single story auditorium, and approximately 1/3 of the classroom wing. The classroom/administration wing above the ground floor level is two stories tall. For purposes of this evaluation the building was not divided into elements, but rather, was considered as a single unit.

Information for this evaluation was based on site observation and study of a partial set of construction drawings. The responses to the ATC-22 Evaluation Statements and follow-up analyses indicate the following:

AUDITORIUM/CLASSROOMS/ADMINISTRATION

EVENT	RATING	REMARKS
Full Collapse	Low Probability	Low hazard potential due to shear wall construction.
Partial Collapse	Low to Moderate Probability	Low hazard potential. Possible loss of support at certain columns.
Component Failure	High Probability	High hazard potential. Possible fracturing of concrete at column-beam connections.
Blocked Entrance	Not Probable	---

ALL ELEMENTS

Concrete floor slab on grade at first floor level, east end; structural reinforced concrete slab at west end over occupied spaces below (flat slab and joisted construction).

Structural reinforced concrete floor slab at second floor (beam and slab construction).

Structural reinforced concrete roof slab at classroom areas. Reinforced gypsum roof deck on steel purlins and steel trusses at auditorium roof.

Reinforced concrete frame construction at north and south longitudinal walls. Reinforced concrete east and west end walls. Reinforced concrete walls on four sides of auditorium.

Tie rod bracing at truss lower chord level at auditorium roof.

Reinforced concrete slabs at roof and floor levels act as horizontal diaphragms connected to reinforced concrete shear walls for remainder of building.

Evaluation Statements revealed the following deficiencies:

1) Weak story at first level.
2) Soft story at the first level.
3) Torsion problems may exist resulting for a non-uniform distribution of shear wall stiffness.
4) Vertical irregularities exist in that shear walls are not continuous to the foundation at the auditorium.
5) Based on the period of construction and other buildings of similar construction, we have assumed:
   a) Confinement reinforcing is lacking in the boundary elements of the shear walls.
   b) There is a deficient amount and type of shear reinforcing at coupling beams.
6) The building fails the shear stress quick check.

Detailed analysis confirmed the following deficiencies:

a) Weak and soft story at the first level of the auditorium south wall.
b) Shear wall at the auditorium south overstressed. D/C = 1.23.
c) Non-uniform distribution of shear wall stiffness in the classroom wing that may result in torsional problems.
d) While unable to confirm actual details of reinforcing, we believe it is reasonable to assume that boundary and coupling beam shear reinforcing is deficient by ATC-22 standards.
e) Shear walls at classroom wing overstressed:
   D/C = 1.61 for interior walls in N-S direction.
   D/C = 1.65 for interior walls in E-W direction.
f) We believe reinforced concrete columns supporting vertical loads do not meet ductility requirements.

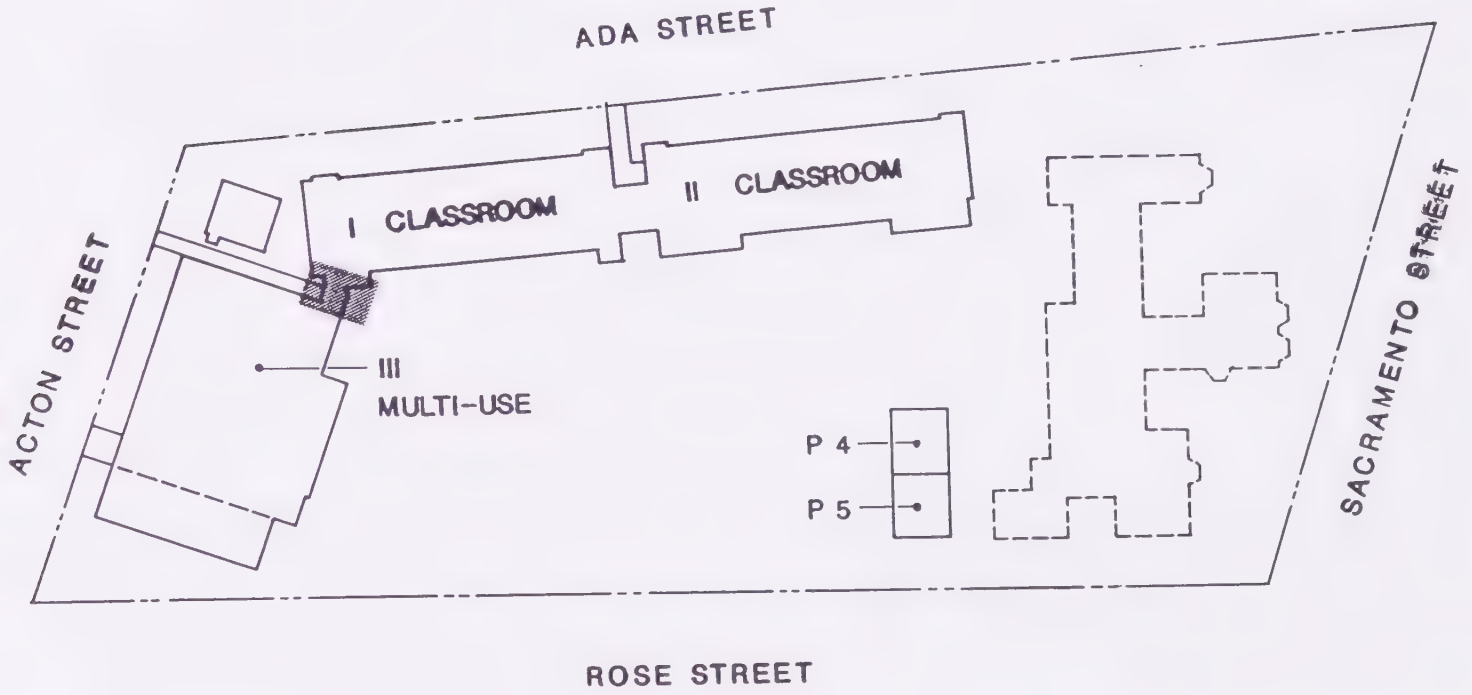
Discussion:

Shear wall construction reduces the possibility of full collapse, but the flexibility of the horizontal diaphragms and possibility of degradation of the shear walls, may allow large deflections in a strong earthquake. However, it is our opinion that partial collapse is unlikely, as interior transverse shear walls will effectively limit the amount of deflection that can occur. It is more likely that the damage would be limited to shear wall cracking and fracturing of concrete at the beam-column locations, which could result in localized falling hazards (pieces of concrete up to volleyball size).

SCHOOL: **JEFFERSON**

LOCATION: Ada Street between Sacramento and Acton School

DATE OF CONSTRUCTION: Original kindergarten building now closed for school occupancy.
Classroom and multi-use addition built 1952.



INDICATES AREAS WHERE HAZARD POTENTIAL HAS BEEN NOTED

SITE PLAN

JEFFERSON

The school is comprised of 3 three all reinforced concrete elements as shown on the accompanying sketch. Elements I and II are similar two-story buildings connected by a reinforced concrete stair structure. Element III is a tall single story building with a lower section on the south side. It also is a reinforced concrete structure, but has a steel framed roof over the multi-use area. The responses to the ATC-22 Evaluation Statements and follow-up analyses indicate the following:

CLASSROOM BUILDINGS - ELEMENTS I AND II

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Low Probability	Loss of column support is not expected. Low hazard potential.
Component Failure	Low Probability	---
Blocked Entrance	Low Probability	---

CLASSROOM BUILDINGS

The two buildings are two-story reinforced concrete structures connected by a reinforced concrete stair element. Building II, otherwise similar to Building I, has a partial basement. The lateral load resisting system consists of reinforced concrete roof and floor diaphragms (concrete joist construction) with reinforced concrete shear walls. Non-ductile reinforced concrete beams and columns support vertical loads between reinforced concrete walls at each end of each building. Extensive architectural windowall construction is used. Foundations are a shallow continuous footing and spread footing system.

Evaluation statements revealed the following deficiencies:

1. Soft story at first level (both buildings)
2. Possible torsional problems resulting from a non-uniform distribution of shear wall stiffness at the first level (both buildings).
3. Vertical irregularities exist in that shear walls are not continuous to the foundation along the north side.
4. Confinement reinforcing is lacking in boundary elements of shear walls.
5. There is a deficient amount and type of shear reinforcing at coupling beams.

All of the above suspected deficiencies were found to be satisfactory by a more detailed analysis, with the exception that reinforced concrete columns and beams do not meet ductility

requirements. It is not expected, however, that the deformations to which these columns will be subjected will cause them to fail.

MULTI-USE BUILDING - ELEMENT III

EVENT	RATING	REMARKS
Full Collapse	Not Probable	Low hazard potential due to shear wall construction
Partial Collapse	Low Probability	Low hazard potential. Loss of vertical support is not expected.
Component Failure	Low Probability	Low hazard potential from spalling concrete.
Blocked Entrance	Not Probable	Vulnerable components are not located at entrances or exists.

MULTI-USE BUILDING

The multi-use wing includes a tall, single story main structure with reinforced concrete walls and a steel joist and truss roof system with metal deck (no concrete fill) and built-up roofing. Steel columns embedded in the reinforced concrete walls provide vertical support for the roof trusses. The reinforced concrete walls also serve as vertical elements of the lateral load resisting system for a shorter kitchen and corridor structure around the perimeter of the main structure. This perimeter structure is comprised of a reinforced concrete flat slab roof system with vertical load carrying reinforced concrete columns at the perimeter. Foundations are a belled pier and grade beam system.

Evaluation statements revealed the following deficiencies:

1. Multiple openings in the south auditorium wall indicate possible deficiencies associated with torsion.
2. Quick shear wall stress check indicated possible overstress in concrete walls.
3. Suspected lack of strength in untopped metal roof diaphragm.
4. Suspected lack of reinforcing at boundary elements of long, narrow low roof diaphragm elements.
5. Lack of ductility in columns supporting low roof.

Detailed analysis showed these suspected deficiencies to be satisfactory with the following exceptions: There is a lack of chord reinforcing in the low roof diaphragm. However, as the main roof reinforcing runs parallel to the chord reinforcing, it can be expected to make up for

this deficiency. Also reinforced concrete columns supporting the low roof do not meet ductility requirements and could be damaged in a strong earthquake.

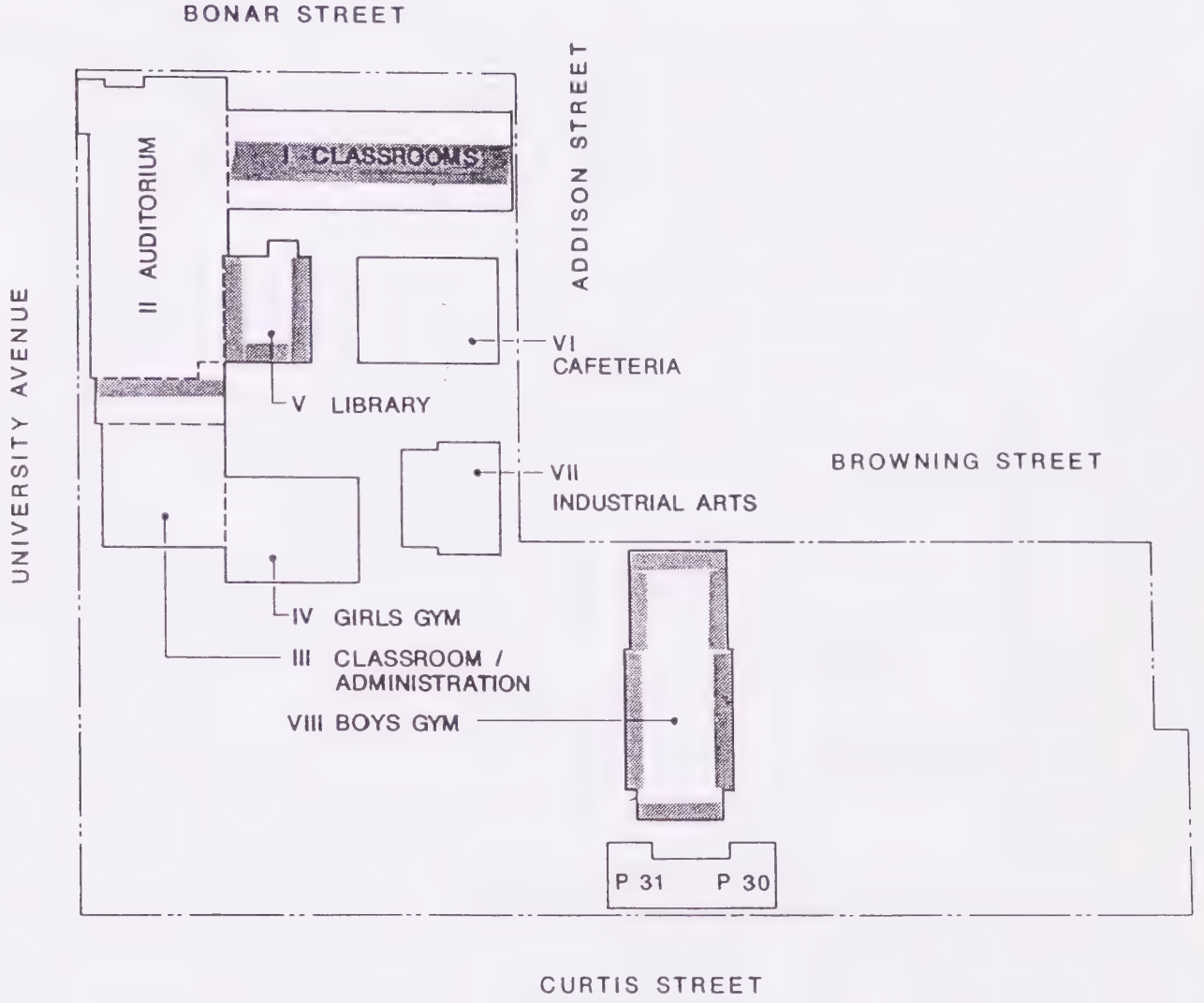
Discussion:

Shear wall construction virtually eliminates the possibility of full or partial collapse, and reduces the effect of torsion so that loss of vertical support is not expected. Some concrete cracking may occur at certain low roof column connections, and at longitudinal ties at the edges of the low roof diaphragm, but is not expected to create a falling hazard.

SCHOOL: **WEST CAMPUS**

LOCATION: University Avenue between Bonar and Curtis Streets

DATE OF CONSTRUCTION: Boy's gymnasium built 1930, reconstructed in 1936.
Library built 1941.
East classroom wing and auditorium built 1953.
Main building, girl's gymnasium, cafeteria and industrial arts building built 1967.



INDICATES AREAS WHERE HAZARD POTENTIAL HAS BEEN NOTED

SITE PLAN

40 0 80
20 40

WEST CAMPUS

The school consists of eight elements as shown on the accompanying sketch. Elements I through V are attached to form a single building without separation joints, but for the purpose of this evaluation the building has been considered by elements. Elements I through IV are of reinforced concrete construction varying in story height from a tall single-story auditorium to a three-story classroom wing. Elements V, VI and VII are of wood frame construction, one-story in height except for the library, which is two stories tall. The boys gym, VIII, is a tall one story element with concrete walls and a wood frame roof.

All ratings which follow are based on the assumption that wood framing and sheathing hidden from view is in good condition. Areas that are accessible, and/or areas where outward signs of wood deterioration is manifest, have been investigated by the Wood Building Research Center of the University of California. Their report follows the evaluation reports of the individual school sites. The responses to the ATC-22 Evaluation Statements and follow-up analyses indicate the following:

CLASSROOMS - ELEMENT I

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Low Probability	Low hazard potential. Loss of support at certain columns unlikely.
Component Failure	Low Probability	Low hazard potential from falling debris.
Blocked Entrance	Not Probable	---

CLASSROOMS

Three story concrete structure. Non-ductile reinforced concrete beams and columns support vertical loads between shear walls. Lateral load resisting system consists of reinforced concrete roof and floor diaphragms with reinforced concrete shear walls in the east-west direction, and non-ductile reinforced concrete columns braced by 8' high concrete walls each side of corridor at each floor level in the longitudinal north-south direction. Foundations are a drilled concrete pile, pile cap and grade beam system.

Evaluation statements revealed the following suspected deficiencies:

1) Building fails the shear stress quick check
2) Vertical irregularities exist in that the interior shear wall is not continuous to the foundation
3) Reinforced concrete beams and columns lack ductility.

A more detailed analysis showed the above suspected deficiencies to be adequate with the exception that reinforced concrete columns at the corridor do not meet ductility requirements and fail the bending check with D/C ratio of 1.8.

Discussion:

Although the columns do not meet ductility or bending requirements, and may crack in a strong earthquake, it is our opinion that the concrete beams will not lose support and cause partial collapse. There is a possibility that spalling of concrete may occur.

AUDITORIUM - ELEMENT II

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Not Probable	---
Component Failure	Not Probable	---
Blocked Entrance	Not Probable	---

AUDITORIUM

Tall, single story structure with reinforced concrete walls, reinforced concrete flat slab over the crawl space at ground floor level and steel beam and truss roof system with a thin reinforced concrete slab. Steel columns embedded in the reinforced concrete walls provide support for the roof trusses. The lateral load resisting system consists of reinforced concrete roof and floor diaphragms connected to reinforced concrete shear walls. Foundations are a drilled concrete pile, pile cap and grade beam system.

Evaluation statements revealed that vertical irregularities exist in the east wall of auditorium but this condition was found to be acceptable by analysis.

CLASSROOM/ADMINISTRATION - ELEMENT III

EVENT	RATING	REMARKS
Full Collapse	Not Probable	----
Partial Collapse	Not Probable	----
Component Failure	Low Probability	Low hazard potential from falling debris.
Blocked Entrance	Not Probable	----

CLASSROOM/ADMINISTRATION

The building is two story reinforced concrete structure. Non-ductile reinforced concrete beams and columns support the vertical load between reinforced concrete shear walls. The lateral load resisting system consists of a reinforced concrete roof and floor diaphragms (concrete joist construction) with reinforced concrete shear walls. The foundation is a concrete caisson and grade beam system.

The building fails the quick check for shear stress in the shear walls. Detailed analysis confirmed that the first floor shear walls are overstressed in shear with a D/C ratio of 1.25.

Discussion:

Shear wall construction should prevent building collapse, either full or partial. Cracking may occur due to high shear stresses in the walls, but we do not expect this to result in any significant amount of falling debris.

GIRLS GYM - ELEMENT IV

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Not Probable	---
Component Failure	Not Probable	---
Blocked Entrance	Not Probable	---

GIRLS GYMNASIUM

The building is a two story concrete structure. Lateral load resisting system consists of reinforced concrete roof and floor diaphragms with reinforced concrete shear walls. Non-ductile reinforced concrete beams and columns support vertical load at 2nd floor and precast beams with reinforced concrete topping at roof. Foundations are a concrete caisson and grade beam system.

All elements meet the requirements of the seismic evaluation statements with the exception that reinforced concrete beams and columns do not meet ductility requirements.

LIBRARY - ELEMENT V

EVENT	RATING	REMARKS
Full Collapse	Not Probable	----
Partial Collapse	Not Probable	---
Component Failure	Low Probability	Low hazard potential from falling debris.
Blocked Entrance	Not Probable	---

LIBRARY

Two story wood framed structure. Concrete foundations and slab on grade at first floor. Lateral load resisting system consists of 1" diagonal sheathing at roof and floor levels and exterior stud walls braced with 1" diagonal sheathing.

Evaluation statements revealed the following suspected deficiencies:

1) Building fails the shear stress quick check
2) Shear walls are not sheathed with plywood.

A more detailed analysis showed that the amount of shear walls is insufficient to resist lateral loads. D/C ratio varies from 1.2 to 1.9.

Discussion:

Shear wall construction should prevent building collapse, either full or partial. Distortion and cracking of finishes may occur due to high shear stresses in the walls, but we do not expect this to result in hazardous falling debris.

CAFETERIA - ELEMENT VI

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Not Probable	---
Component Failure	Not Probable	---
Block Entrance	Not Probable	---

CAFETERIA

One-story wood frame bearing wall system with plywood horizontal diaphragms and plywood shear walls.

Evaluation statements were all found to be true.

This building is judged to have no deficiencies.

INDUSTRIAL ARTS - ELEMENT VII

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Not Probable	---
Component Failure	Not Probable	---
Block Entrance	Not Probable	---

INDUSTRIAL ARTS

One-story wood frame bearing wall system with plywood horizontal diaphragms and plywood shear walls.

Evaluation statements were all found to be true.

This building is judge to have no deficiencies.

BOY'S GYMNASIUM - ELEMENT VIII

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Low Probability	Very low potential for partial collapse due to intertying of structural elements.
Component Failure	Moderate Probability	Moderate hazard potential from falling debris.
Blocked Entrance	Moderate Probability	Moderate hazard potential. Falling debris could impair egress.

BOYS GYMNASIUM

One story reinforced concrete shear wall building with a high roof over the gymnasium and a lower roof over locker room and entry area. Straight sheathing and wood purlins are supported on steel trusses at the gym roof. A horizontal bracing system is provided at the truss lower chord level. Straight sheathing and wood joists supported by timber beams frame the lower roof. The gym has a wood framed floor, while the locker room has a concrete floor slab on grade. The lateral load resisting system is provided by the reinforced concrete shear walls and the straight sheathing or horizontal bracing system noted above.

Information for this evaluation was based on site observation and study of a partial set (1 sheet) of working drawings.

Evaluation statements revealed suspected deficiencies as follows:

1) Roof diaphragm consists of straight sheathing.
2) Connections for shear transfer from roof diaphragm to shear walls are lacking.

Detailed analysis confirmed the suspected deficiencies:

a) Roof diaphragm is not adequate to resist lateral loads.
b) Horizontal steel bracing connections are overstressed at corner strut connections in bracing.

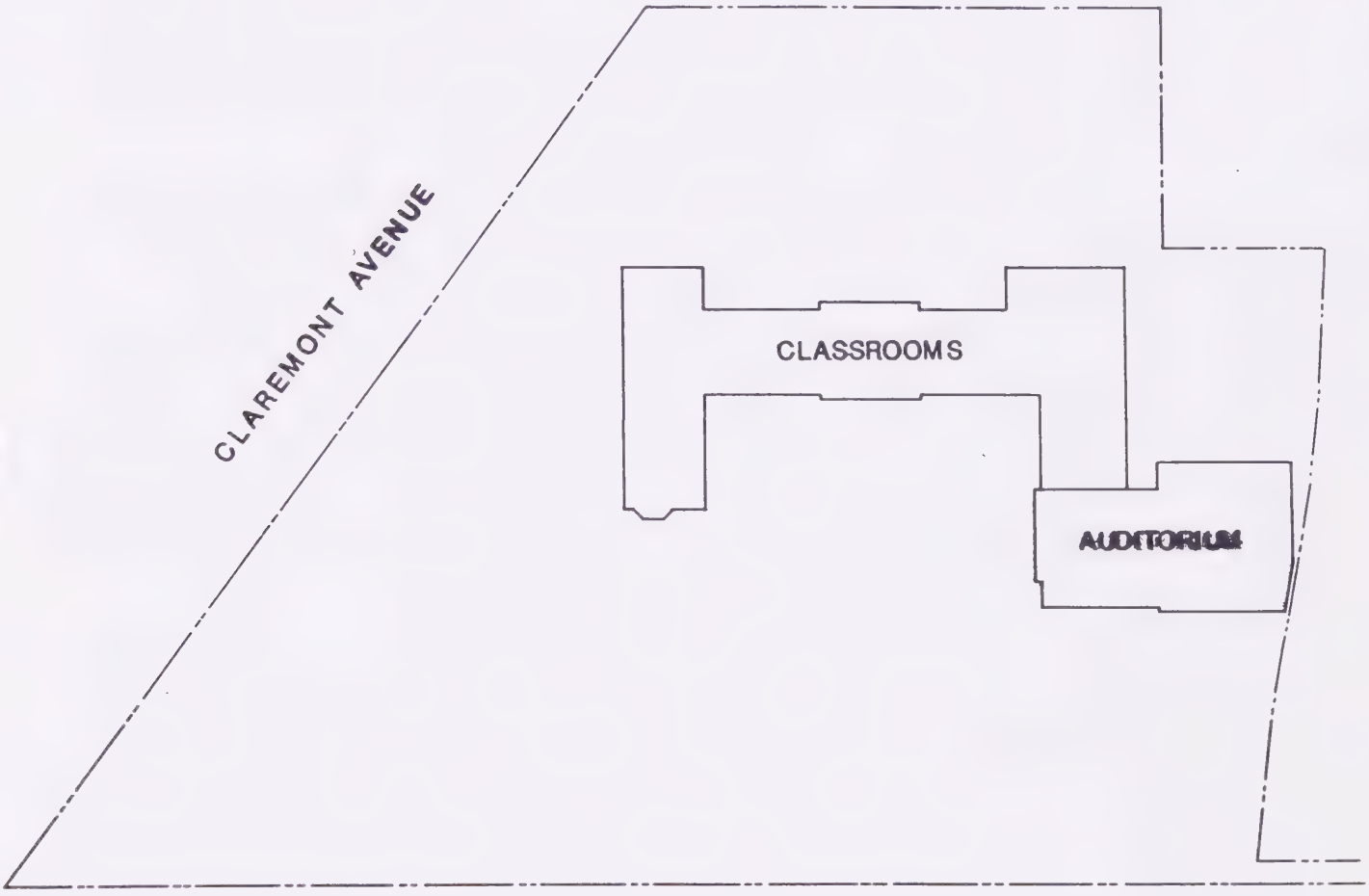
Discussion:

Not all connections at roof framing and sheathing to exterior walls could be confirmed. Based on information available connections would be significantly overstressed in strong earthquake shaking. If horizontal steel bracing sustains connection failures lateral load would transfer to roof sheathing. Under such circumstances, building would be much more flexible and finishes, ceilings and fixtures may be damaged.

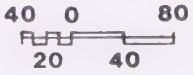
SCHOOL: **JOHN MUIR**

LOCATION: Claremont Avenue near Ashby Avenue

DATE OF CONSTRUCTION: Classroom and auditorium originally constructed 1915 and expanded 1919.
Kindergarten portion of classroom wing and auditorium rehabilitated 1937.
Classroom wing, including kindergarten reconstructed 1976.



SITE PLAN



JOHN MUIR

Two story wood frame construction for both the classroom and auditorium wings. The classroom wing was strengthened for seismic resistance, and was structurally isolated from the already rehabilitated auditorium wing in 1976. Both wings employ shear walls for lateral load resistance. The auditorium walls are sheathed with diagonal sheathing. The newer classroom wing is sheathed with plywood.

All ratings which follow are based on the assumption that wood framing and sheathing hidden from view is in good condition. Areas that are accessible, and/or areas where outward signs of wood deterioration is manifest, have been investigated by the Wood Building Research Center of the University of California. Their report follows the evaluation reports of the individual school sites. The responses to the ATC-22 Evaluation Statements and follow-up analyses indicate the following:

CLASSROOM WING

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Not Probable	---
Component Failure	Not Probable	---
Blocked Entrance	Not Probable	---

CLASSROOM

Pre-field Act two story wood frame building was strengthened for seismic resistance in 1976 with additional foundations, plywood sheathed shear walls, floor and roof diaphragms.

Evaluation statements revealed no suspected deficiencies except that the building failed the shear wall stress quick check.

Detailed analysis, however, determined that the structure meets ATC-22 acceptable criteria.

AUDITORIUM WING

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Not Probable	---
Component Failure	Low Probability	Very low hazard potential from falling debris
Blocked Entrance	Not Probable	---

AUDITORIUM

Pre-Field Act two story wood frame building was strengthened for seismic resistance in 1937 with diagonal sheathing at floors, exterior walls and selected interior walls. A horizontal wood bracing truss was added above the second floor ceiling.

Evaluation statements revealed deficiencies as follows:

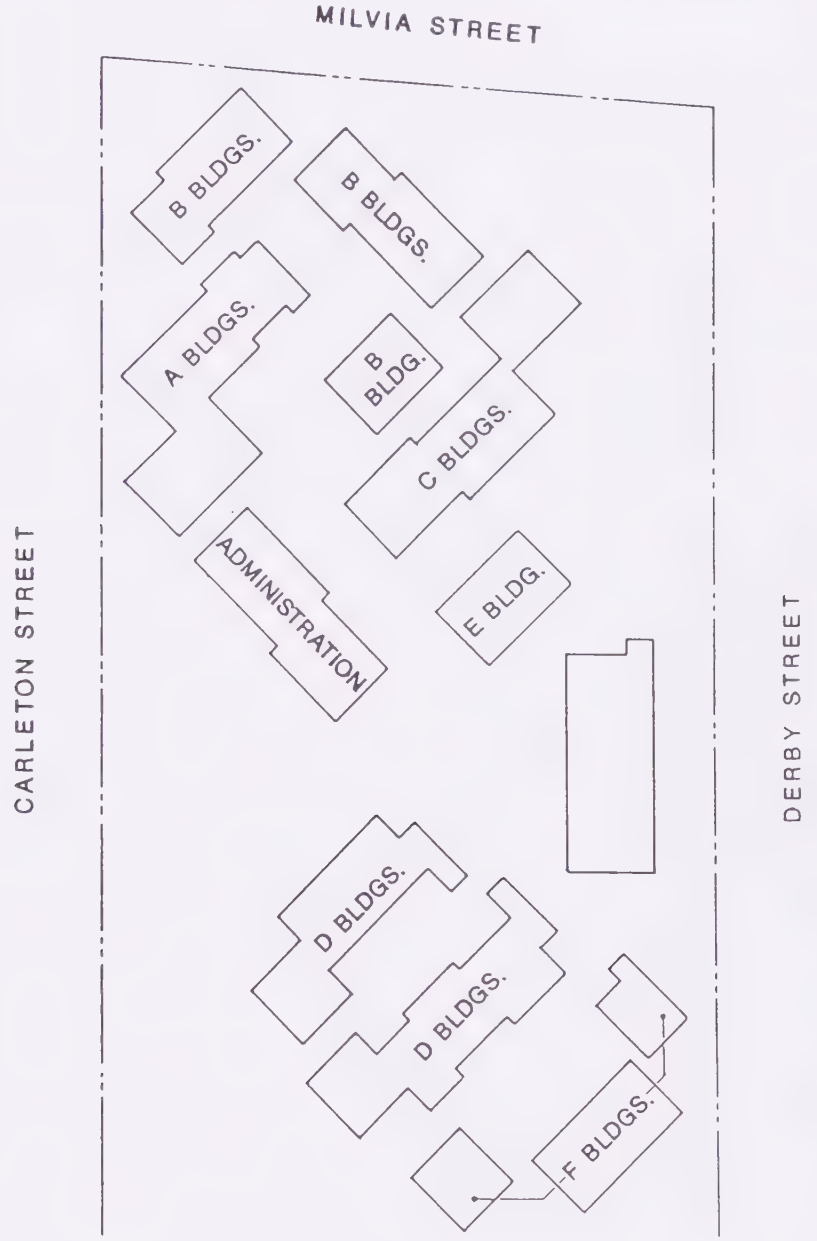
1) Building fails the shear wall stress quick check.
2) Shear walls are not sheathed with plywood and are constructed without holdowns.
3) Wood posts lack positive connections to the foundations.

All items were found to be satisfactory by subsequently detailed analysis. Distortion of shear walls is possible with some cracking of finishes, but no collapse is anticipated. Flexibility of shear walls and lack of holdowns could result in a minor amount of falling debris.

SCHOOL: **EAST CAMPUS - BERKELEY HIGH**

LOCATION: Block bounded by Derby and Carleton Streets
Milvia and M.L. King Jr. Way

DATE OF CONSTRUCTION: 1971



SITE PLAN

5 10 30
0 20 40

EAST CAMPUS - BERKELEY HIGH

East Campus is as grouping of approved modular units on designed reinforced concrete foundations. While each unit was itself approved, minor modifications were made to the units, and the units were attached to each other to form "buildings". The buildings, in turn, were tied together with an exterior covered walkway structure that consisted of rigid steel bents that support a wood framed roof deck and walkway deck.

For the purpose of this evaluation, the units were analyzed as nine separate buildings as shown on the accompanying sketch. All ratings which follow are based on the assumption that the wood framing and sheathing is in good condition where not visible.

ALL BUILDINGS - GROUPINGS 1 THROUGH 9

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Not Probable	---
Component Failure	Not Probable	---
Blocked Entrance	Not Probable	---

ALL BUILDINGS

One story portable 10'x32' modular steel frame structure with wood joists at roof and steel joists at floor. Roof diaphragms and floor diaphragms, as well as exterior shear walls are sheathed with plywood. Foundations are reinforced concrete.

Evaluation statements were all found to be true.

The buildings are judged to have no deficiencies.

COVERED WALKWAY

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Not Probable	---
Component Failure	High Probability	High hazard potential due to falling roof boards.
Blocked Entrance	High Probability	High hazard potential. See above.

COVERED WALKWAY

Rigid steel bents that support 2x tongue & groove roof decking and 2x4 redwood boards as a walkway deck.

Evaluation Statements regarding design to resist lateral forces were all found to be true. However, due to deterioration of the materials of construction, the following hazardous conditions were noted:

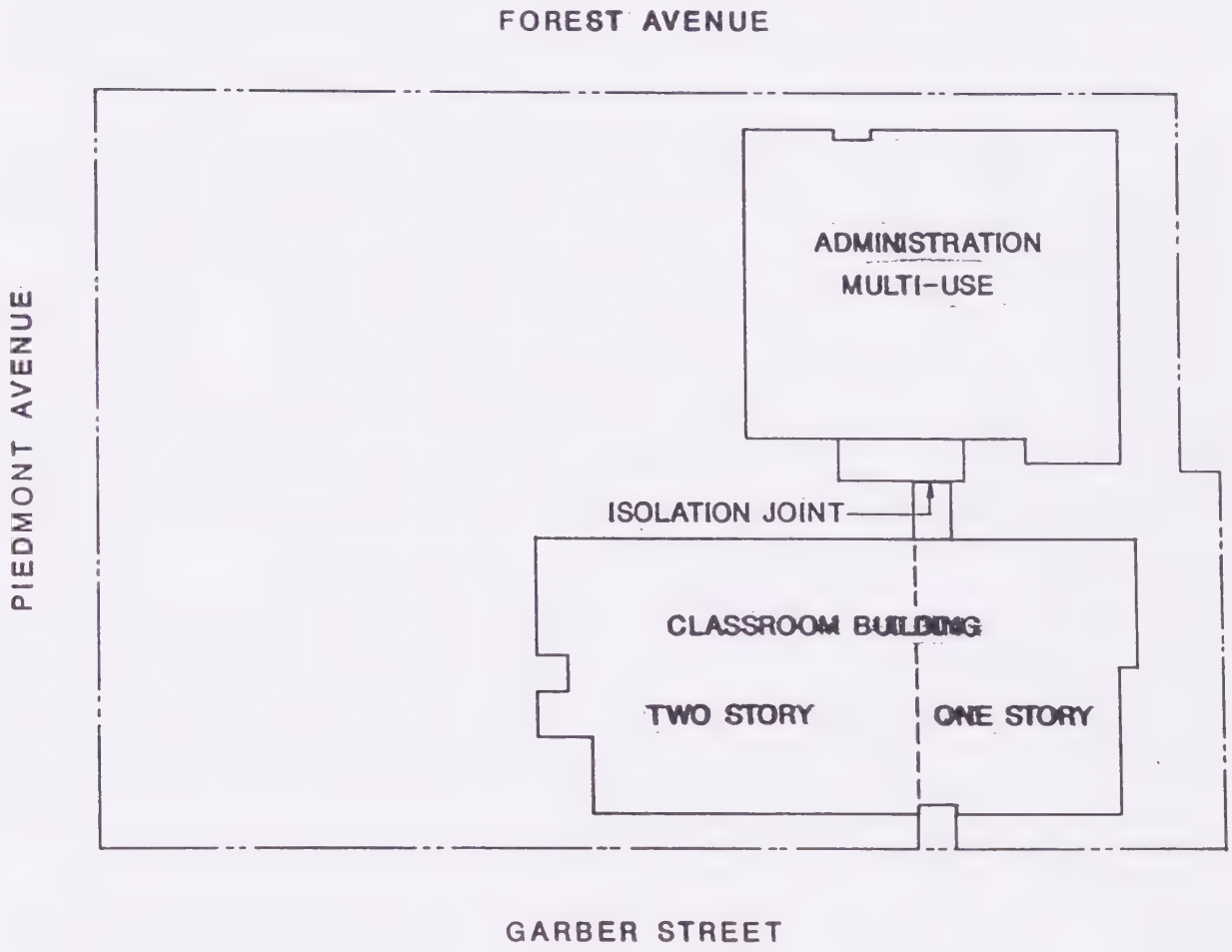
Walkway roof decking is in an advanced state of decay due to brown rot. Boards could crack and fall if subjected to severe earthquake shaking. Falling boards could impede egress.

Boards at the walkway deck are worn and loose. While they will not fail when subjected to earthquake forces, they can present a tripping hazard.

SCHOOL: **EMERSON**

LOCATION: Forest Avenue at Piedmont

DATE OF CONSTRUCTION: Original building demolished.
New buildings constructed 1965.



SITE PLAN

5 0 10 20 30 40

EMERSON

The school consists of two elements, structurally isolated from one another, as indicated on the attached plan. The classroom building is partly a one story and partly a two story wood frame structure. The administration/multi-use building is a single story wood frame structure. The roof over the multi-use area is raised.

All ratings which follow are based on the assumption that wood framing and sheathing hidden from view is in good condition. Areas that are accessible, and/or areas where outward signs of wood deterioration is manifest, have been investigated by the Wood Building Research Center of the University of California. Their report follows the evaluation reports of the individual school sites. The responses to the ATC-22 Evaluation Statements and follow-up analyses indicate the following:

CLASSROOM BUILDING AND ADMINISTRATION/MULTI-USE BUILDING

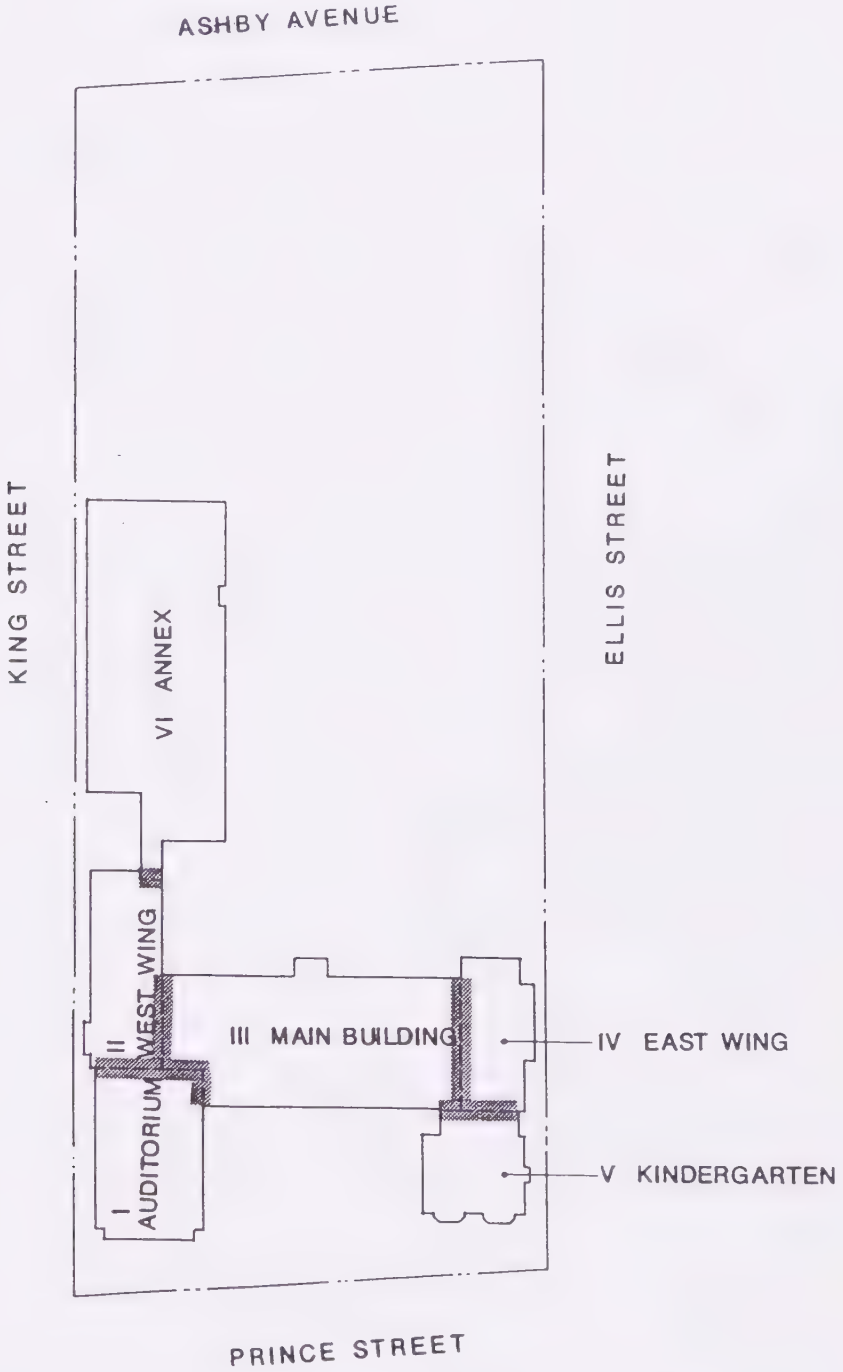
EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Not Probable	---
Component Collapse	Not Probable	---
Blocked Entrance	Not Probable	---

The classroom building adjoins, but is structurally isolated from, the administration/multi-use building. Both buildings have a concrete slab-on-grade floor at the lowest level, wood framed upper floor and roof structure with steel beams and wood framed interior and exterior walls. The lateral force resisting system consists of plywood sheathed floor and roof diaphragms connected to perimeter and interior plywood sheathed shear walls. All elements meet the requirements of the seismic evaluation statements. No building collapse or element failure is anticipated.

SCHOOL: **MALCOLM X (FORMER LINCOLN SCHOOL)**

LOCATION: Prince Street between King and Ellis Streets

DATE OF CONSTRUCTION: Original building rehabilitated 1936.
Classroom addition constructed 1964.



INDICATES AREAS WHERE HAZARD POTENTIAL HAS BEEN NOTED

SITE PLAN

20 0 20 40

MALCOLM X - 1

MALCOLM X

For purpose of evaluation the school has been divided into six elements as shown on the accompanying sketch. The main classroom building, which includes the auditorium and kindergarten is generally one, two and three story wood frame construction above reinforced concrete walls that extend above grade to the first floor. The tall one-story auditorium has full height reinforced concrete walls, steel purlins and roof trusses with wood rafters and sheathing.

The classroom annex is a two story structure with a concrete floor slab on grade, wood frame roof and second floor construction and tilt-up reinforced concrete exterior wall panels.

All ratings which follow are based on the assumption that wood framing and sheathing hidden from view is in good condition. Areas that are accessible, and/or areas where outward signs of wood deterioration is manifest, have been investigated by the Wood Building Research Center of the University of California. Their report follows the evaluation reports of the individual school sites. The responses to the ATC-22 Evaluation Statements and follow-up analyses indicate the following:

AUDITORIUM - ELEMENT I

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Not Probable	---
Component Failure	Low Probability	Low hazard potential from falling debris.
Blocked Entrance	Not Probable	Vulnerable components not located at exits.

AUDITORIUM

Tall one story reinforced concrete building. Slab-on-grade floor construction with partial basement under the stage. Full height reinforced concrete shear and/or bearing walls on all sides. Roof construction consists of steel roof trusses, steel purlins and wood rafters with straight sheathing at roof level and a horizontal bracing truss system at the bottom chord level of the roof trusses.

Evaluation statements revealed the following deficiencies:

1) Inadequate shear reinforcing in coupling beams
2) Plan irregularity at intersection of auditorium and classroom walls; i.e. parallel shear-

resisting elements at auditorium and classroom do not align
3) Roof diaphragm is not sheathed with plywood.

All items were subsequently found to be satisfactory be detailed analysis. The juncture of the classroom and auditorium walls may experience minor cracking or tearing, but this is not judged to be a significant hazard.

CLASSROOMS AND KINDERGARTEN - ELEMENTS II - V

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Not Probable	---
Component Failure	High Probability	Moderate hazard potential from falling debris.
Blocked Entrance	Low Probability	Falling debris not expected to restrict egress.

CLASSROOMS AND KINDERGARTEN

One, two and three story wood construction above reinforced concrete walls that extend from grade to the first floor. Conventional wood framed floors and roof. 1x6 diagonal sheathing at floors and 1x6 straight sheathing at the roof, with a horizontal bracing truss at the upper floor ceiling level. Diagonally sheathed exterior walls resist loads in the longitudinal east-west direction and diagonally sheathed interior and exterior walls resist loads in the transverse north-south direction.

A horizontal steel bracing truss at the first floor level of element III is connected to reinforced concrete walls below to resist lateral loads in the transverse direction.

Evaluation statements revealed the following deficiencies:

1) Horizontal floor and roof diaphragms are not sheathed with plywood
2) Wood shear walls are not sheathed with plywood, and lack holdown anchors at panel ends
3) Reinforced concrete shear wall boundary elements lack confinement reinforcing
5) Shear reinforcing in coupling beams is inadequate
6) Reinforced concrete shear walls lack adequate ties, or dowels to the foundation
7) Plan irregularity at intersection of main building III and west wing II
8) Plan irregularity at intersection of main building III and east wing IV
9) Plan irregularity at intersection of east wing IV and kindergarten V

All items were subsequently found to be satisfactory by detailed analysis except the following:

a) Interior wood shear walls between classrooms at element II are overstressed. Demand/capacity ratio. D/C = 1.28
b) Exterior wood shear walls at the west side of element II have high overturning forces. D/C = 1.96
c) Interior wood shear walls between classrooms at the second floor level of element III have high overturning forces. D/C = 1.84
d) Interior wood shear walls below the first floor level of element III (south side) have high overturning forces. D/C = 2.16

Discussion:

Shear wall construction minimizes eliminates the possibility of collapse -- full or partial, but the flexibility of horizontal diaphragms and shear walls may allow large deflections in a strong earthquake. Possible cracking and/or tearing of finishes may result at the juncture of the various levels and wings of the building. All walls may also experience distortion and cracking of finishes. It is our opinion that such component failure, even though extensive, does not seriously threaten life safety.

CLASSROOM ANNEX - ELEMENT VI

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Not Probable	---
Component Failure	Not Probable	---
Blocked Entrance	Not Probable	---

CLASSROOM ANNEX

Two story building with tilt-up reinforced concrete wall panels, wood framed roof and second floor, and a concrete slab on grade at the ground floor level. Roof and floor horizontal diaphragms, as well as wood shear walls, are sheathed with plywood.

Evaluation statements revealed the following deficiency:

1) Dowels between wall panels and foundation less than vertical wall panel reinforcing.

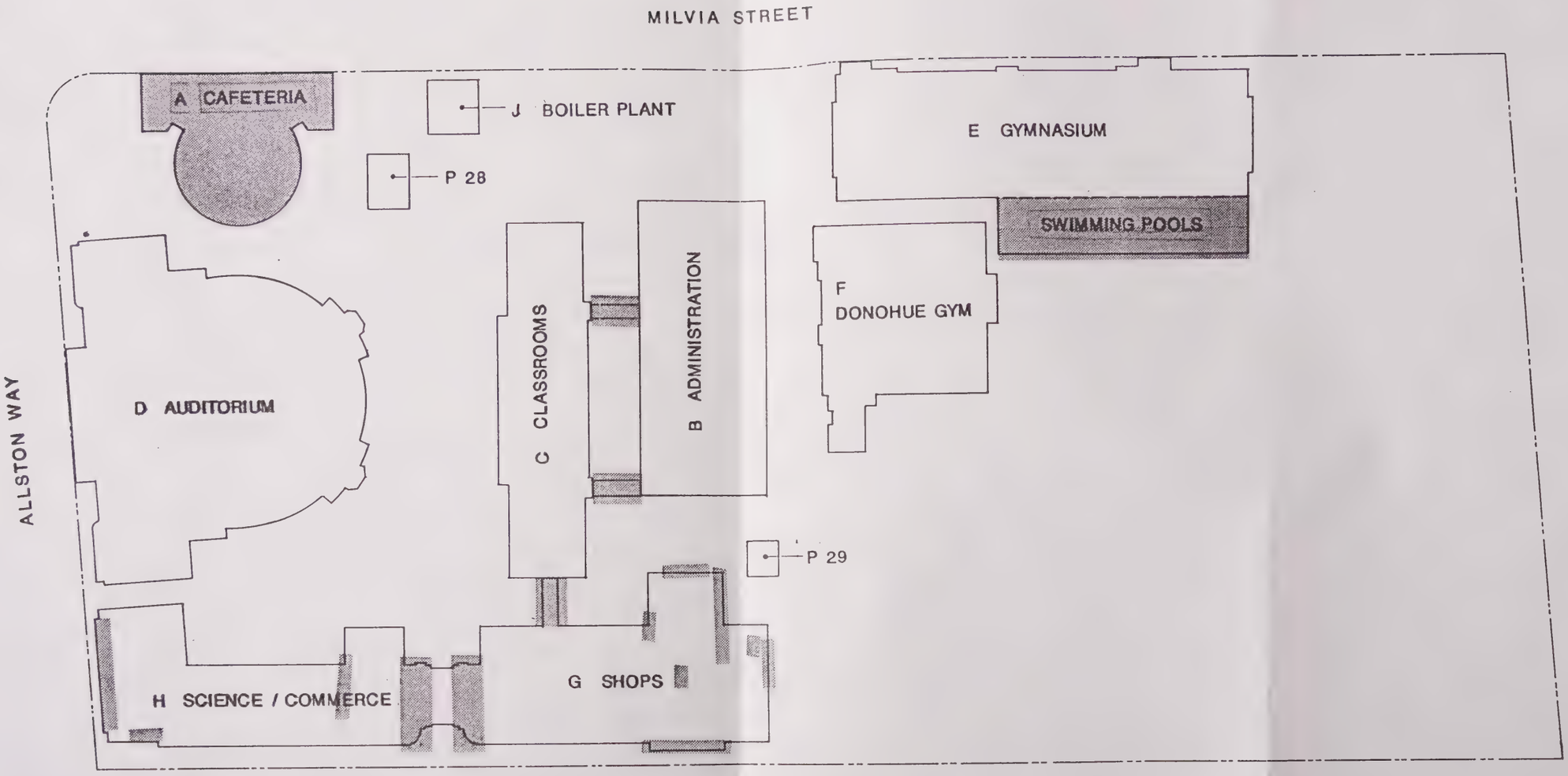
Detailed analysis indicates the reinforcing provided is adequate.

SCHOOL: **BERKELEY HIGH SCHOOL**

LOCATION: In the blocks bounded by M.L. King Jr. Way, Allston Way, Milvia Street and Channing Way

DATE OF CONSTRUCTION:

Cafeteria, Built 1961
Administration Building, Built 1964
Classroom Building, Built 1920, remodelled in 1965
Remodelled and seismic strengthening, 1981
Auditorium, Started 1940 and completed after WWII.
Gymnasium, Swimming Pools, Built 1922.
Enlarged 1929, rehabilitated 1937 and 1978.
Donahue Gymnasium, Built 1978
Shops - Built 1940
Science and Commerce - Built 1940



SITE PLAN

INDICATES AREAS WHERE HAZARD POTENTIAL HAS BEEN NOTED

40 20 0 40 80

BERKELEY HIGH SCHOOL

Berkeley High School consists of 8 major structures which have been built at different times and modified from time to time. In general, the buildings are constructed of reinforced concrete or steel frames and reinforced concrete combined. In some instances wood has been used for roof construction. The eight buildings are indicated on the accompanying sketch and are described as follows:

The Cafeteria, Building A, is a two story structure constructed in part of steel framing and reinforced concrete. Other portions are reinforced concrete frame construction and reinforced concrete tilt-up walls. Floors above ground level are poured-in-place reinforced concrete and the roof is metal deck, without topping, on steel framing.

The Administration Building, Building B, is a two story reinforced concrete shear wall structure. Upper story shear walls are pre-cast and lower story shear walls are cast-in-place infilled between steel columns. The second floor and roof are metal decking with a lightweight concrete topping on the floor decking.

The Classroom Building, Building C, is a three story reinforced concrete shear wall building with a single story roof penthouse.

The Auditorium, Building D, is of reinforced concrete and steel frame construction. A portion of the roof employs wood sheathing.

Gymnasium/Swimming Pools, Building E, is composed of two elements built separately and later connected. Both elements are of reinforced concrete shear wall construction with steel floor and roof trusses. Floors above ground and roofs have straight wood sheathing.

Donahue Gymnasium, Building F, is a reinforced concrete tilt-up structure employing steel and timber roof framing.

Shop Building, Building G, is a two and three story reinforced concrete bearing and shear wall building with roof and floors above grade of reinforced concrete beam and slab construction.

Science Building, Building H, was built at the same time as Building G and is similar in construction. An entrance structure which was built at the same time as Building G and H fills the space between them. It is two stories high and of similar construction.

All ratings which follow are based on the assumption that wood framing and sheathing hidden from view is in good condition. Areas that are accessible, and/or areas where outward signs of wood deterioration is manifest, have been investigated by the Wood Building Research Center of the University of California. Their report follows the evaluation reports of the individual school sites. The responses to the ATC-22 Evaluation Statements and follow-up analyses indicate the following:

CAFETERIA - BUILDING A

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Moderate to High Probability	No torsional structural system at upper story of circular building. Inadequate moment capacity of radial steel moment frames. Could cause localized loss of support.
Component Failure	Moderate to High Probability	Non-ductile concrete frame at lower story of circular building; weak column/strong beam system; inadequate ties and anchorage of column bars and pre-cast panels. Concrete debris from cracked members is possible.
Blocked Entrance	Low Probability Moderate to High Probability	At rectangular building. At circular building due to stairway being at center of circular non-ductile concrete frame system.

CAFETERIA

Because of the unusual configuration of this building a more detailed than usual description is included here.

This two-story building is composed in plan of a circular element, roughly 105' in diameter, which partially overlaps a 160'x46' rectangular block by approximately 28'. The longitudinal edge or the rectangular building is slightly notched at the two points of contact with the circumferential perimeter of the circular building. The roof plane of the circular building is 5'-6" higher than that of the rectangular one.

In addition to differing in their plan geometry and heights, the building's two blocks differ in their structural systems as well. The roofs of both are framed by structural steel beams and columns supporting bare metal decking with no concrete topping slab. The circular building has a series of 12 steel frames arranged radially in plan. Each consists of a W16 girder and perimeter column and an interior W8 column. Moment fixity is provided at the W16 beam-column connection at the knee joint and at the base of the W16 column to the concrete 2nd floor framing. However, the interior column is pin-ended at its top and bottom, with the beam cantilevering over it to a free end at the central skylight. The circumferential beam-column connections have no flange connections to develop moment capacity and the beam is eccentric with respect to the axis of the column, its web aligning rather with the outside column flange. Thus, while there may be lateral load resistance provided by the moment-frames in the radial direction, there is no such resistance provided torsionally. (The circumferential precast panels enclosing the perimeter of the space are fully glazed concrete frames and can offer no significant resistance.) The beam-column joints in the rectangular building have no flange moment capacity provision, being simply web-bolted.

The rectangular building has perimeter pre-cast concrete wall panels between roof and second floor slab. These panels serve as the lateral load resisting elements for the upper story of the rectangular building and presumably are also meant to provide resistance to torsional movement of the circular building. However, there is no positive connection between the high circular roof and the lower rectangular roof save for weak-axis vertical cantilevering of some steel columns.

The second floor is of cast-in-place reinforced slab and beam construction throughout. In the circular portion, the beams are arranged in a radial and tangential pattern and supported by reinforced concrete columns. Again, as in the steel roof framing, the intent seems to be to create moment resisting frames in a radial direction. Since the tangential beams are cast integrally with the columns, some torsional resistance by circumferential frame action could be anticipated as well. However, bending would occur about the weak axis of the columns.

The floor framing system in the rectangular area is supported by a combination of cast-in-place reinforced concrete columns and walls. The walls are grouped around the central core of the plan while the outer bays at each end have only column support. All lateral load resistance is concentrated in this central core of walls. Thus, the projecting bays of the rectangular building, as well as the circular building, could be subject to torsional forces. As in the roof plan, the horizontal diaphragm is notched at the juncture of the overlap between circular and rectangular plans. Furthermore, it is at these locations that the diaphragm is cut out for placement of the stairs. However, the stair wells are surrounded in their entirety, except for the door openings, by reinforced concrete walls.

The foundation system consists of drilled, belled cast-in-place reinforced concrete piers. They are spanned by reinforced concrete grade beams supporting concrete walls above and are doweled to them. However, the piers supporting isolated columns in the rectangular building and the moment frame columns in the round one are not interconnected by grade beams. Dowels are provided to the columns, but the number of dowels and their sizes do not match those of the column bars.

Evaluation Statements revealed the following suspected deficiencies:

STEEL MOMENT FRAME (at Round Building)

1. Torsion: The lateral force resisting elements are all radial, pointing to a common center, with no provision for torsional frame action. The center of mass to the center of rigidity of shear walls in the adjacent rectangular building is greater than 20% of the building width.
2. Drift Check: The building does not satisfy the Quick Check for frame drift.
3. Moment Connections: The beam-column flange connection is bolted, not welded.
4. Plan Irregularities: There does not appear to be significant tensile capacity at re-entrant corners or other locations of plan irregularities.
5. Dock Topping: The metal-deck has no concrete topping slab.

STEEL FRAME WITH CONCRETE SHEAR WALLS (at Rectangular Building)

6. Vertical Discontinuities: Not all perimeter shear walls are continuous to foundation.
7. Torsion: Same as item 1 above.
8. Wall Connections: There is no connection indicated between the wall panels and the steel columns.
9. Plan Irregularities: Same as Item 4.
10. Deck Topping: Same as Item 5 above.
11. Transfer to Shear Walls: Welding of decking diaphragm boundaries is not shown on Drawings.
12. Wall Reinforcing: Vertical wall reinforcing is not doweled to concrete framing below. (See Item 13 below.)
13. Shear Wall Boundary Columns: There are no boundary columns, rather there is a welded dowel insert at each end of each pre-cast wall panel.

CONCRETE MOMENT FRAME

14. Torsion: Same as Item 1 above.
15. Shearing Stress Check: The building does not satisfy the Quick Check for stress in the frame columns.
16. Shear Failures: The shear capacity of the frame columns is not greater than their moment capacity.
17. Strong Column-Weak Beam: The moment capacity of the columns is not greater than that of the beams.
18. Column Tie Spacing: Frame columns do not have ties spaced at d/4 or less throughout their length, nor at $8d_b$ or less at all potential plastic hinge points.
19. Beam Bars: In the tangential frames, at least 25% of either the positive or negative steel provided at the joints is not continuous throughout the member.
20. Beam Bar Splices: The lap splices for the longitudinal beam reinforcing are not all located within the center half of the member lengths.
21. Joint Reinforcing: Column ties do not extend through all exterior beam-column joints.
22. Concrete Columns: Longitudinal column steel is not doweled into the foundation with the same number and size of bars.

CONCRETE SHEAR WALLS

23. Torsion: Same as item 1, 7, and 14 above.

A Visual Site Inspection revealed no significant distress, aside from a few minor hair-line concrete cracks, in the building.

A detailed analysis corroborated the deficiencies suspected or revealed by the True-False Evaluation Statements.

ADMINISTRATION BUILDING - BUILDING B

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Not Probable	---
Component Failure	Moderate Probability	Concrete headers may pose a falling hazard for egress.
Blocked Entrance	High Probability	Upper level steel framing at bridgeway has no lateral system. Visual site inspection of metal panels and concrete bridgeway confirmed this. The east entry canopy is an inverted pendulum structure with insufficient ductility, as detailed on the drawings, at its base. The partial or full collapse of the bridgeway and the concrete canopy at east egress can block exiting of building.

ADMINISTRATION BUILDING

This a two-story reinforced concrete shear wall building. Upper story shear walls are pre-cast reinforced concrete wall/window panels along the building perimeter. The lower story shear walls are poured-in-place, in-filled between steel columns, reinforced concrete at the building perimeter, and an interior 8" reinforced concrete two-story shear wall in the transverse direction. The roof and floor diaphragms are metal decking with lightweight concrete topping at the floor.

Evaluation Statements revealed the following suspected deficiencies:

1) Pre-cast shear panels are under-reinforced by Code minimum.
2) Roof diaphragm lacks a concrete topping slab.
3) Pre-cast shear panels are not doweled into the floor with reinforcing equal to vertical panel reinforcing.
4) Stirrups in coupling beams between wall panels are spaced greater than d/2.
5) Connections for forces normal to wall is not apparent.
6) Shear transfer between diaphragm and wall panels is not apparent.

However, all above items were found to be satisfactory by detailed analysis.

Visual site inspection revealed the following building system conditions:

a) Metal panels at bridgeway between building "B" and "C" were "peeling away" from structural framing.
b) Columns of concrete bridgeway platform were observed to have a slight lean to the east at ground level.
c) Concrete header over window/door opening between shear walls had shrinkage cracks spaced along its length.
d) South concrete shear walls at ground floor had vertical crack at center of wall; these cracks ran up the wall and through concrete beam above.

CLASSROOM BUILDING - BUILDING C

EVENT	RATING	REMARKS
Full Collapse	Not Probable	---
Partial Collapse	Not Probable	---
Component Failure	Not Probable	---
Blocked Entrance	High Probability	Upper level steel framing at bridgeway has no lateral system. Visual site inspection of metal panels and concrete bridgeway confirmed this. With the exception of the north entrance, the other three egresses are either beneath or through the concrete bridgeways. The partial or full collapse of the bridgeways can block exiting of building.

CLASSROOM BUILDING

This is basically a long rectangular three-story reinforced concrete box with a single story penthouse at the roof. The setback for the penthouse is a sixth of the total longitudinal plan dimension. The original building category was "Bearing Wall System." This construction lacked adequate lateral resisting elements and ductility in the vertical piers. In 1981, rehabilitation work, designed by Shapiro, Okino and Hom, Assoc., installed additional collectors and shear walls at each floor. Foundation work included enlarging pad footings under new shear wall locations.

Evaluation statements revealed the following suspected deficiency:

1) Large diaphragm opening adjacent to shear wall at stairs and skylight.
Calculation indicated adequate chord reinforcement around openings and sufficient tensile capacity at areas lacking continuity. Diaphragm unit shear to the stairwall in question, by the approximate quick check, indicated low shear stress. Therefore, the diaphragm openings do not diminish the diaphragm's ability to transfer the lateral forces to the shear wall.

Visual site inspection revealed the following building system condition(s):

a) Reinforcing steel at window sills along the north elevation is exposed. Corrosion of exposed steel is evident.
b) Columns of concrete bridgeway platform at south face of building were observed to have a slight lean to the east at ground level.
c) Metal panels at bridgeway were "peeling away" from structural framing.

Visual site items 'b' and 'c' are of the same bridgeway mentioned in Building "B" summary draft report.

AUDITORIUM - BUILDING D

EVENT	RATING	REMARKS
Full Collapse	Not Probable	
Partial Collapse	Not Probable	
Component Failure	Not Probable	
Blocked Entrance	Low Probability	Coupling beam stirrups might come unravelled due to lack of anchorage and release debris which may block egress.

AUDITORIUM

The majority of the building was designed and constructed in the early 1940's. The west wing, known as the "Little Theater," was of prior construction and no existing drawings were made available for this particular evaluation. The building was left incomplete for the period of World War II and completed after the War.

The basic building geometry consists of an 80 ft. high single-story reinforced concrete crescent cylinder with an equally tall single-story reinforced concrete rectangular box at it open end. Each side of the rectangular box is flanked by lower wings. The east wing is a 2-story reinforced concrete shear wall building. The west wing (the "Little Theater") is likewise of reinforced concrete construction with a mezzanine balcony in this one-story high space. Both wings are of the same overall height. The typical horizontal diaphragm is a reinforced concrete slab. The exception is the roof diaphragm over the crescent cylinder portion of the auditorium. The horizontal bracing in this case consists of steel ring-trusses at the top and bottom chord elevations of the roof trusses with the uppermost level overlaid with 3" T & G straight board sheathing. The general condition of the structure is good.

Evaluation statements revealed the following suspected deficiencies. Responses to suspected deficiencies are noted with each deficiency.

1) Coupling beam stirrups were not anchored by 135° hooks.
2) Diaphragm opening adjacent to shear wall is greater than 35% of wall length.
   However, roof and floor girders do align with shear walls, thus facilitating the transfer of diaphragm shear into walls.
   Concrete roof and floor slabs brace the wall for out-of-plane loading.
3) Soft ground story due to large window wall openings along the north elevation.
   Detailed analysis, taking torsion into consideration, revealed that the interior stairwell shear wall is adequate for stress.

some discontinuities and/or do not extend full width between shear walls. they are typically overlaid with straight board sheathing. The open space between the two building has been enclosed with light steel roof framing; this has the effect of coupling two independent structures into one. At about the same time in the past, the gymnasium was expanded eastward toward Milvia Street. This expansion consists of two-story light wood framing attached to the original gymnasium. This building, unlike the original, has no horizontal steel truss but only straight board sheathing for diaphragms.

Evaluation statements revealed the following suspected deficiencies:

SWIMMING POOL/SHOWER ROOM

1. Steel column boundary elements have a marginal amount of shear dowels into concrete shear walls along their vertical edges.
2. Existing drawings do not provide detail of steel column base plate. Therefore, uplift capacity of the base plate cannot be determined.
3. Shear wall vertical reinforcing does not dowel into foundation. The 3/4"Ø Cinch Anchors which are provided at 6'-0" o.c. are inadequate for shear transfer.
4. Concrete wall at the roof is inadequate for out-of-plane bending between anchorage points.
5. Although tensile capacity of horizontal steel angle braces is adequate for diaphragm end reactions, they are too slender for compressive stress at the roof. (This is a typical comment.)
6. The design of the shower room roof framing resulted in the coupling of the pool building with the 2-story gymnasium. This introduces significant torsional plan irregularity to the overall structure.

GYMNASIUM

7. Roof and 2nd floor diaphragms have straight and diagonal board sheathing respectively, with a span/depth ratio less than 2:1. The unit shear along diaphragm edge is greater than that allowed per ATC-22 (Table 2-6).
8. Straight board sheathed diaphragm spans greater than 24 feet and therefore requires, by Code, plywood or diagonal sheathing.
9. Balcony diaphragm is inadequate to span to end walls due to large stair openings.
10. Out-of-plane capacity of transverse concrete wall between roof and 2nd story cannot be determined due to lack of information on existing reinforcement.
11. In-filled shear panels are inadequate to take lateral forces due to the lack of Cinch Anchors.
12. Existing drawings do not show new footings at locations of new shear walls and in-filled shear panels. Confirmation of this is a priority item.
13. Transverse steel frame has component deficiencies under compressive loading.
14. Foundation footing at steel frame is inadequate for lateral loading. Shear keys into slab on grade are inadequate to take balance of load.

Detailed analysis show items 1 and 5 are adequate for stresses. Further study, both exploratory and by calculation, is needed for items 2, 6, 9, and 11. The remaining items are deficient and should be addressed with strengthening design details.

Visual site inspection revealed the following building system conditions:

SWIMMING POOL

a) Deterioration of substantial amount of structural steel due to moisture.
b) Horizontal steel truss diaphragm has a missing diagonal.
c) Top of tile walls show "dishing" cracks at centerline of steel columns.
d) South-east section of building has continuous visible diagonal cracks across the pool floor width and up both transverse walls.
e) Flexure cracks were observed at the common concrete shear wall between girl's and boy's pool areas.

GYMNASIUM

f) Shrinkage cracks between the original concrete columns and the new in-fill concrete window jambs on either side.
g) Shrinkage cracks around infilled concrete panels at the concrete wall frames.
h) Substantial water leakage where the 2-story light wood expansion attaches to the original gymnasium.

DONOHUE GYM - BUILDING F

EVENT	RATING	REMARKS
Full Collapse	Not Probable	
Partial Collapse	Not Probable	
Component Failure	Not Probable	
Blocked Entrance	Not Probable	

DONOHUE GYM

This a modern reinforced concrete tilt-up building built in accordance with substantially the same standards as apply in the most modern codes. ATC-22 is based upon the ultimate strength method of analysis as opposed to the working stress method of analysis used for the design of Donohue Gym. Applied loads and allowable stresses for both methods are comparable when conversion ratios are applied. Other than concrete shrinkage cracking in the walls no strength reducing deterioration was observed. Because of the substantial reserve strength of the shear walls the shrinkage cracking is not structurally significant.

SHOP BUILDING - BUILDING G

EVENT	RATING	REMARKS
Full Collapse	Not Probable	
Partial Collapse	Moderate Probability	The wall piers are under-reinforced for shear and carry floor and roof framing. Cracking and loss of carrying capacity is possible.
Component Failure	High Probability	See above. Shear wall transfer at stairs is probably inadequate.
Blocked Entrance	High Probability	As a result of partial collapse as well as shear wall failure at stairs.

SHOP BUILDING

This building is T-shaped in plan, mostly two-story with a three-story section set off-center. It was built about 1939 or 40. It is entirely reinforced concrete slab, beam and girder construction with interior reinforced concrete columns and exterior reinforced concrete bearing walls ranging from 10" to 16" in thickness, establishing it as a shear wall building. There are a number of interior shear walls, as well, at the first and second stories.

The following Evaluation Statements are of interest, even though not all were checked false.

SOFT STORY: (False) The language of the Statement form implies separate consideration of stiffness "elements" and of the stories; the north and south walls of the third story are carried on beams and columns, and thus the stiffness below is less than 70% of that of the walls above. The second story as a whole is stiffer than the third story as a whole.

GEOMETRY: (False) There is not only a severe setback at the third floor level, but it is eccentric with respect to the stories below.

MASS: (True) It is not clear that the exception for "light" roofs should apply to this case, where the lightness (30% of the level below) is a function of the roof area, not the weight of its components per square foot.

VERTICAL IRREGULARITIES: (False) The north and south walls of the third story are not carried to the foundation, but rather rest on beams and columns, with the ends of the walls above having a random relationship to the columns below.

TORSION: (False) The first story has a net (calculated plus 5% "accidental") eccentricity of 28% due to introduction at this level of large walls at the north end of the building.

CONCRETE WALL CRACKS: (True) Close viewing discloses numerous small cracks trending horizontal and vertical at such a close interval that lack of cover over the wall reinforcing seem s to be the cause.

DETERIORATION OF CONCRETE: (False) The walls have been patched and painted; fresh spalling is evident where severely rusted reinforcing steel is typically disclosed on examination. Many areas of exposed, rusted reinforcing may be seen along the west side of the building. The overall effect on shear walls already insufficiently reinforced can only be estimated after further investigation.

SHEARING STRESS CHECK: (False) A mild overstress was calculated in the East-West direction. This is not a very good checking technique for a building like this one.

REINFORCING STEEL: (False) The wall piers directly under the beams and girders do not have enough horizontal reinforcing; it ranges from .0020 to .0017, or 80% to 68% of that required. This might be tolerable if these piers were not part of the vertical load supporting system and evidence of past, present and future corrosion widespread.

OVERTURNING: (False) While only a few of these have hw/lw much in excess of 4, some are under-reinforced for shear.

CONFINEMENT REINFORCING: (False) Only an occasional shear wall that ends at a column can be said to have any confinement at all, and that does not qualify for spacing.

COUPLING BEAMS: (True) Spandrels are deep enough that this was not checked.

OPENINGS AT SHEAR WALLS: (False) Stair No. 1 has framing on its boundaries to stabilize it out-of-plan but has framing to serve as collectors on only two of the three walls at the third floor level.

SHEATHING: (False) The third floor roof has a span/depth ratio of 2.15.

TRANSFER TO SHEAR WALLS: (False) The west wall of Stair No. 1 does not align with framing to serve as a collector, nor does it have special reinforcing. A similar condition exists at Stair No. 3.

SCIENCE/COMMERCE BUILDING - BUILDING H

EVENT	RATING	REMARKS
Full Collapse	Not Probable	
Partial Collapse	Moderate Probability	The wall piers are under-reinforced for shear and carry floor and roof framing. There are no ties between columns at the crawlspace grade level. Cracking and loss of carrying capacity is possible.
Component Failure	High Probability	See above.
Blocked Entrance	High Probability	May result from partial collapse noted above and shear wall failure at stairs. Truss action of stairs may cause failure at landings. There is a large glass block window at the north stair. The connecting bridges may cause battering between the bridges and the adjacent buildings.

SCIENCE/COMMERCE BUILDING

This building is L-shaped in plan, mostly two-story with a three-story section set to the extreme north. It was built about 1939 or 40. It is entirely reinforced concrete slab, beam and girder construction, including the 1st floor, which if framed over a crawlspace. There are interior reinforced concrete columns and exterior reinforced concrete bearing walls ranging from 10" to 16" in thickness, establishing it as a shear wall building. There are a number of interior shear walls, as well, at the first and second stories.

The following Evaluation Statements are of interest, even though not all were checked false.

GEOMETRY: (False) There is not only a sever setback at the third floor level, but it is eccentric with respect to the stories below.

MASS: (True) It is not clear that the exception for "light" roofs should apply to this case, where the lightness (42% of the level below) is a function of the roof area, not the weight of its components per square foot.

VERTICAL IRREGULARITIES: (False) The south and west walls of the third story are not carried to the foundation, but rather rest, in part, on beams and columns, with the ends of the piers above having a random relationship to the columns below. A short wall at the southwest corner of the second story is similarly discontinuous.

TORSION: (False) The first story has a net (calculated plus 5% "accidental") eccentricity of 26% due to the eccentric location of the third story.

CONCRETE WALL CRACKS: (True) Close viewing discloses numerous small cracks trending horizontal and vertical at such a close interval that lack of cover over the wall reinforcing seem s to be the cause. There are one-way diagonal cracks in the south wall of the north stair at the third story.

DETERIORATION OF CONCRETE: (False) The walls have been patched and painted; fresh spalling is evident where severely rusted reinforcing steel is typically disclosed on examination. Many areas of exposed, rusted reinforcing may be seen along the west side of the building. The overall effect on shear walls already insufficiently reinforced can only be estimated after further investigation.

SHEARING STRESS CHECK: (False) A significant overstress was calculated in the north-south direction at the first story. This is not a very good checking technique for a building like this one.

REINFORCING STEEL: (False) The wall piers directly under the beams and girders do not have enough horizontal reinforcing; it ranges from .0020 to .0017, or 80% to 68% of that required. This might be tolerable if these piers were not part of the vertical load supporting system and evidence of past, present and future corrosion widespread.

OVERTURNING: (False) Only one wall has hw/lw much in excess of 4.

CONFINEMENT REINFORCING: (False) Only an occasional shear wall that ends at a column can be said to have any confinement at all, and that does not qualify for spacing.

COUPLING BEAMS: (True) Spandrels are deep enough that this was not checked.

TRANSFER TO SHEAR WALLS: (False) Two north-south shear walls at the south end of the building do not have collectors.

ENTRANCE STRUCTURE

This building is two-story and rectangular in plan. It is located between the Science and Commerce Building on the north and the Shop Building on the south. It was built about 1939 or 40. It is entirely reinforced concrete slab, beam and girder construction, including the 1st floor, which is framed over a crawlspace. There are interior reinforced concrete columns and exterior reinforced concrete bearing walls ranging from 8" to 10" in thickness, establishing it as a shear wall building. There are a number of interior shear walls as well at the first story.

The evaluation of this element of Buildings G and H is substantially the same as for Building H.